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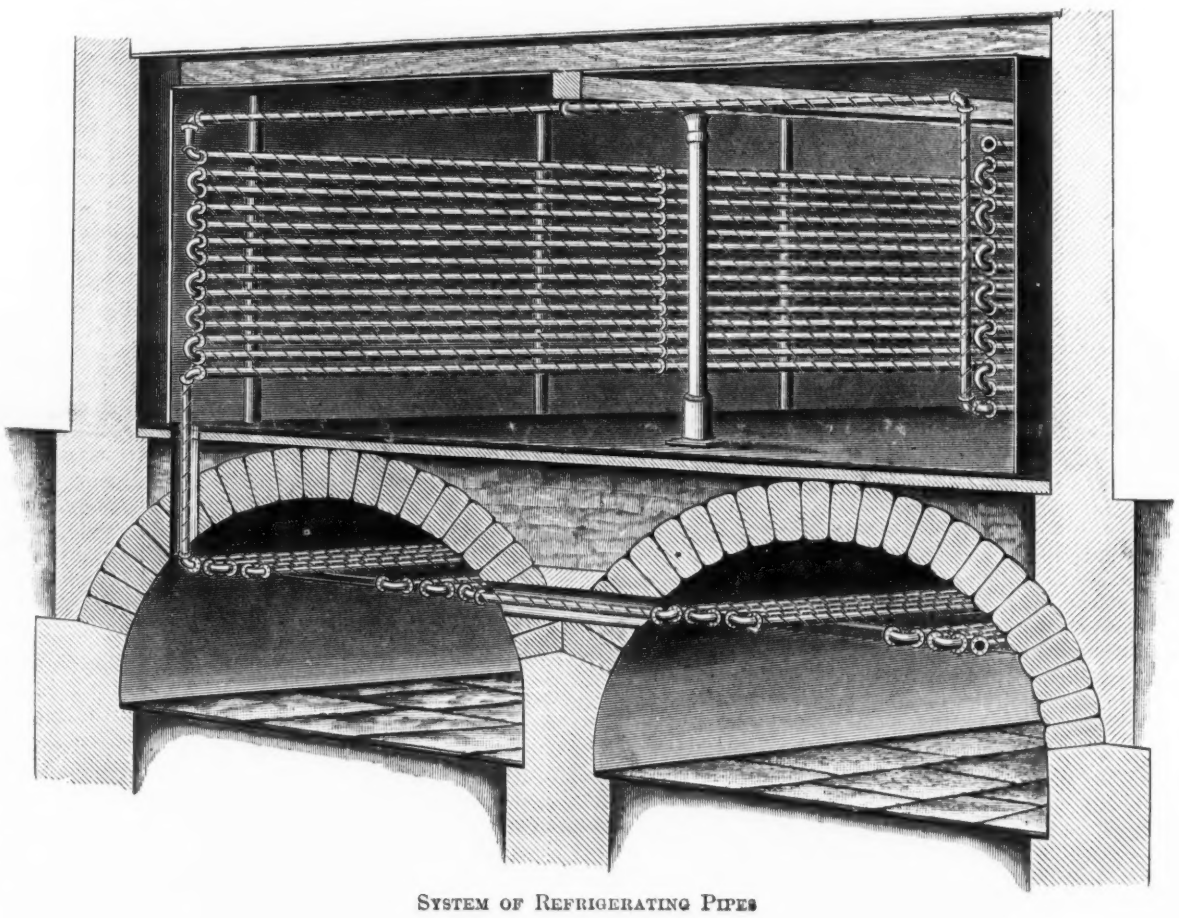
System of Refrigerating Pipes.

For refrigerating, or cooling the air of rooms for various purposes, one process consists in circulating water, cooled by the evaporation of ether through the employment of suitable machinery. The water is circulated through a system of pipes, going out at a very low temperature—so low that ice forms on the pipes—and returning at a temperature considerably increased, by the effort at equalization between the temperature inside the pipes and the temperature of the air in the rooms. Since it involves a considerable expense to fit up large rooms for this purpose, it is an object to use pipe that will present the least obstruction to the equalization of temperature, by which the quantity of pipe necessary to use will be diminished.

The engravings represent a portion of the refrigerating pipes as arranged throughout the rooms of the extensive brewery of Gluck and Scharman, of Brooklyn, N. Y. Their system of pipes were put in by the Abendroth & Root Manufacturing Co., 28 Cliff st., New York, and consists of an arrangement of the wrought iron spiral pipe manufactured by this company. The spiral feature of this pipe makes it extremely strong, even when made of comparatively light iron, which particularly fits it for the purpose.

The iron for this pipe is galvanized in the sheet before the pipe is made; in addition to which the pipe is galvanized both inside and outside after being manufactured; the object being to prevent the possible exposure of the surface of the iron.



SYSTEM OF REFRIGERATING PIPES

Comparisons Between High and Low Speed Engines.

BY CHAS. A. HAGUE.

IV.

However fascinating and interesting the study of natural laws may be, and with whatever pleasure and instruction we may hold the physical proofs of our abstract deductions, we must not lose sight of the fact that in producing successful steam engines, stern necessity compels us to keep within a profitable scope in competing with other folks in the same business. To have the best thing is not enough. Other people must be convinced of the fact. And in endeavoring to convince them fanaticism in any one particular direction is to be avoided.

The commercial relations borne by any thing made and sold necessarily retard the growth towards perfection. The thing must be made to pay first, and be refined afterward. New effects that are continually arising, and which are termed "incidental," are only indications of other sets of conditions upon which the maker was not well enough informed to calculate; therefore these different indications must be followed up and arranged in their appropriate positions in the general sequence. An almost endless variety of phases may be continually observed, and to follow them up and ascertain their correct practical value, especially with large steam engines, requires much time, experience and expense

In these days of exact science, when very many branches of human industry are divided and sub-divided into separate specialties, it need be no matter of surprise if we draw a line in this engine question; and make "steam economy," and "steam engine economy," two different branches. Steam economy of itself, may be effected at the expense of nearly everything else. It may last five days or five months; it may prove a perfect myth upon investigation. Ever since the introduction of the automatic cut-off engine, and it became possible to regulate the speed of an engine by varying the length of the steam line, instead of adjusting the height of the admission line, there have been many attempts at going to extremes in the matter of expansion, and of course many disappointments in not saving 90 per cent. or so of the steam in high grades of expansion, to say nothing of losses of a mechanical nature from operating the motor under such disadvantages of pressure.

"Steam engine economy," simply represents an engine in which steam economy is only carried to an extent that shall prove compatible with durability, regularity of motion, and freedom from annoying and expensive stoppages during business hours. Experience teaches that engines operating under conditions which render possible these desirable mechanical qualities, also attain to the highest cylinder efficiency. In comparing high and low speed engines upon these grounds, we are forced to the conclusion that when the short stroke motor shall have proven itself to be the equal of the long stroke in the above necessary qualities, its first cost will be the greater of the two.

A varying rate of speed is very often a most potent enemy, not only to steam economy, but a varying rate of speed in a cotton mill may bring about losses of more moment than the entire engine question, whether it be high speed or low speed that is involved. The motor that has, up to date, furnished the most uniform velocity to cotton spindles is not of the high-speed persuasion of the present day, although there was a time when people stood aghast at what was then considered its extraordinary rate of motion. The office of the governor or regulator in the leading types of automatic engines, is simply to indicate to what length the initial steam shall urge the piston before suppression takes place; and it is not called upon to assist in holding or operating the valve connections. The pioneer of this class of motors, and probably the most successful to-day for medium and large powers, is so arranged that when operated under normal conditions the regulating mechanism is absolutely free from connection with the valves during 75 per cent. of the piston's stroke; and in fact the only contact that could possibly produce disturbing effects upon the regulator, is of such short duration as to be practically instantaneous.

The increased number of revolutions performed by the high speed engine, has been advanced as a means of superior uniformity of motion, inasmuch as it furnishes an increased number of opportunities for regulation; but this quality seems to me to be of very doubtful value in practical operation, when the fact is considered that the long-stroke motor at moderate speed is free from the regulator such a mere fraction of a second during each stroke. It is not possible to transmit a change in power through a system of belting, within such a brief space of time, that would produce any perceptible effect where the engine is at all reasonably proportioned to its load. With an engine cutting off at $\frac{1}{4}$ stroke, and making 70 revolutions per minute, it will be seen that one stroke takes place in 3-7 of a second. Cutting off at $\frac{1}{4}$ stroke leaves $\frac{3}{4}$ beyond the control of the regulator, and the time occupied by this $\frac{3}{4}$ stroke is just $\frac{9}{28}$ of a second. When we attempt to transmit a demand for more or less power through from one to three large and somewhat elastic belts, within 9-28 of a second, we shall probably find that the regulator knows all about it in ample time to make the necessary adjustment.

Odd Ways of Melting Iron.

BY THOS. D. WEST.

There is probably as much reason for changes in the plan of melting iron as there is in moulding jobbing work. Melters will sometimes get nervous at being ordered to charge up their cupola in as many different ways as there are days in the week. A foreman that understands his business very seldom lays out a system, or a table of charges, for his melter to follow day after day, in a regular jobbing shop. The foreman may have various reasons for wanting his melter to make all these changes. To-day he may want the cupola to melt extra fast during the first of the heat, and slowly after some heavy casting is poured, in order to have melted iron to feed with. To-morrow, seeing that some moulder will not get ready in season, this order may be reversed. As he does not want to keep his men late when it can be avoided, he orders the cupola charged, so that the men having small work can be pouring off while the large casting is being got ready. This casting, that, perhaps, weighs five tons, may not be thick in any of its parts, so as to require much feeding, and the bottom can be dropped soon after it is poured. In this way the only moulders kept late are the ones that were going to keep the whole shop's crew behind, which, for a shop that pays overtime, would be expensive, and, in any case, is not pleasant for the men.

On some days the shop floor may be covered

with a class of work that is better for being poured with dull iron, and the next day the work may be such as to require very hot iron. Again, there will be heavy and light castings, requiring entirely different grades of iron; and to complicate matters the foreman, if an observing man, will see that the brand of iron is not of the same grade as the last car load. All of the above causes, to which could be added quality of fuel, sometimes make a thoughtful foreman think of a string tied full of knots.

I will try and show in this, two of the many plans that may be adopted to meet different conditions that may be new to some. One is for melting special grades of iron, and the other to retain the bed in a cupola after melting a heat for a break-down job, or for a piece of casting that is wanted in a hurry.

I worked once in a rolling mill company's foundry, and sometimes when everything was about poured off, there could in the distance be seen some one of the managers running towards the foundry, as if he meant business. Our ignorance of the cause of his haste would soon be enlightened by seeing a team, or some men bringing a pattern. This pattern would be given to some competent moulder, and two or three reliable moulders would be retained to help him. By this time all the moulds are poured off and the cupola man has received instruction not to drop the bottom, but to prepare it to melt iron again in the course of three or four hours. The way to do this is as follows: Leave the blast on until you are sure all the iron in the cupola is melted, and instead of dropping the bottom knock out the front breast, and with a bent hook pull out all the clinkering coke or coal and iron cinder that can be felt or seen. Then fill up the breast hole with loose sand, and every 5 or 10 minutes take away the sand and pull out again whatever clinkers or iron cinders will have formed, repeating the operation for the first half hour or so, or until you are sure that all the droppings of iron and clinkers are pulled out. After this, every half hour or so will be sufficiently often to clean the bottom out. The stopping up of the breast every time the clinkers are cleaned out is done to prevent the fuel from burning away, and also to keep the clinkers and droppings of iron from being chilled with the air.

After the cupola is well cleaned out, there should be some fuel shoveled in, so as to freshen up and keep the fire in good burning condition. When the moulders have their mould or moulds about ready, then make up the breast as usual, and shovel in the fuel for a bed, the same height as for a regular heat. After it gets to burning, charge up the iron wanted, put on the blast, and you will soon have your cupola melting iron again. The first two or three hundred of iron is generally dull, and sometimes will have to be poured into a pig bed. After this the iron will come hot enough for ordinary casting.

The question of how large a heat a cupola run in this way would melt could not be better answered than by the following: One morning early, two or three men were called upon to mould up a piece of machinery for a repair job. The melter and helpers were called to the shop to get the cupola ready as soon as possible. The casting, the weight of which was about 2,500 pounds, was poured about eleven o'clock in the morning. The iron was all blown down, the breast knocked out, and the cupola treated as above described, until the time for the regular afternoon heats, which were never less than 12 tons. The blast was again put on, and after the first few hundred pounds, the iron was as good and as hot as usual. The time that the cupola was held from one heat to another was about four hours. The size of this cupola was a five foot shell.

To prevent the mixing of different grades of iron, when melted at one heat, has been the cause of a deal of thought and many experiments with foundrymen. I know of a foundry owner who makes a practice of melting only one grade of iron at a time. If he has a roll to cast, he will only charge up the iron weighed off for it. The blast will then be put on and all the iron in the cupola melted and tapped out. The blast is then stopped and the bed renewed with coke. Another grade of iron is then charged up and all melted down. I remember one day his making three distinct blow-outs during the same heat. The first was about 7,000 pounds for a roll; the second, about 2,000 for soft work, and the third was common iron to finish off a heat of about eight tons. The size of the cupola that this was done in, was about a four foot six inch shell. This same gentleman has a reputation for turning out castings of the grade of iron wanted, and it is owing to no more nor less than the way he charges up his cupola, and in being particular in the mixing and selection of his iron. The objection to this style of melting is that there is a little more coke used, and it takes from half an hour to one hour longer to run a heat off.

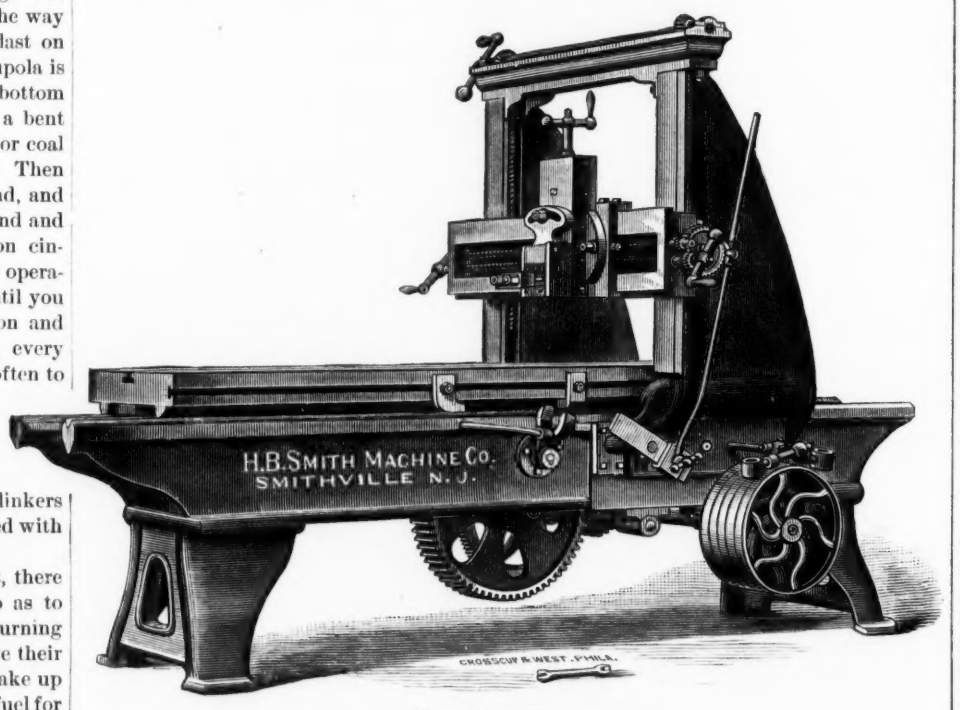
It seems almost an impossibility to run a straight heat, when there are two or three different grades of iron to melt, without having them mix more or less, and the less the weights of the different grades to be melted the more will they be liable to mix. For example: Charge an ordinary cupola with a regular charge of a special grade of iron, with the usual charge of fuel on top, and so on, charging with distinct grades of iron. As the grades of iron melt, pour some castings, the weight of which should not be less than 50 pounds. On the following day melt the special grades of iron by themselves, and pour some castings, and then compare the runners and gates, and you will see that there is a difference.

It is generally known that hard iron will melt sooner than soft iron, and most foundry men, when making a casting of hard iron, have the hard iron charged first, to make sure of having the casting of good, sound iron and of the grade wanted. If they have soft iron to run, it is generally charged on the top of the hard iron. This is a plan that I do not always approve of, as there are always more or less particles of any grades or charges of iron left remaining among the fuel and on the bottom and sides of a cupola, and which will affect two or three other charges.

A plan that I find to work well, when there are two charges of soft iron wanted, is to melt the hard iron first; then, instead of putting the soft iron directly on the top of the hard iron, I charge about two charges of common iron—either soft or hard. On top of these charges the soft iron will be charged. After, as I think, all the hard iron is down, then the common iron is tapped out until, by the number of ladles carried off, I think it is all melted. At this point the soft castings are poured according to the degree of softness wanted. The softest casting wanted, if there have been three charges of soft iron charged, should be taken from what is thought to be the middle or second charge.

In some cases where I have only a small amount of very soft iron wanted, I charge up the soft iron on the top of the bed, which should be burning well, and should not have in as much fuel by from 4″ to 6″ as for ordinary heats. This iron will be put in from one half hour to one hour before any of the other charges of iron are put in, and when all is ready to have the rest of the charges put in, make the first charge of fuel (that which is placed between the first and second charges of iron) a large one; as much larger than usual as the bed was left low. By this means the large charge of fuel takes a longer time to get hot enough to melt the upper charge of iron, and when the first charge of iron is melted, the second, or large charge of fuel, will come down and raise the bed up to the proper height to run the balance of the heat off. I have by this plan charged hard iron on the top of soft iron.

When not taking out the soft iron too closely to the amount charged up, the castings have been as soft as if the hard iron had never been charged up. It is in having only small quantities of different grades of iron to melt, that there is serious trouble with their mixing together. With large quantities there is more chance of having castings the grade wanted, but even then the melter must use judgment in seeing that the iron is charged as it should be, and the foreman should be watchful, so as to know that the iron is taken away from the cupola as the grades melt or come down. There is nothing about a foundry that requires such changes in its management as a jobbing foundry cupola.



New Iron Planer.

New Iron Planer.

We illustrate on this page an Iron Planer built from new designs and patterns, and so arranged that the parts subjected to greatest strains are made extra strong. The bed has great depth and sufficient length to prevent the table from tipping when heavily loaded on overhanging ends. The table is deep in section and very heavy. The bolt slots are planed to a gauge and the pin holes reamed out accurately to size.

The uprights or posts are very heavy and stiff, the back form being that of a parabola, having great breadth at the base, making it possible to take heavy cuts when the cross head is at its greatest height from the table, without jar or chatter. In this machine the uprights are some ten inches wider than the table, thus admitting wide work, such as saw tables, frames, &c., to be planed much wider than the table of the machine.

The small gears are of steel, the rack and all gearing being accurately cut; the shafts are of large diameter with long substantial bearings, all being requisites for a machine that will plane accurately and smoothly.

The feeding mechanism gives automatic feed in all directions, is adjustable from very fine to wide cuts for finishing, and takes no power except when feeding, there being no frictional connections.

The table is reciprocated back and forth by open and cross belts—the pulleys on the countershaft being of different sizes so as to make the return movement quick without any extra gearing. The speed may be increased or diminished to meet the requirements of any special work, by simply changing the pulleys on the countershaft. The movement of the table may be stopped at any point of the cut or return motion without stopping the countershaft, and again started at will. The belt-shifting arrangement is such that no two belts are on the tight pulleys at the same instant, thus obviating a squeaking noise common in many machines. The motions of the table and feed of tool are under perfect control of the operator, and as the working parts are made about one-third heavier than usual, strength and durability are fully secured.

The machine shown in the engraving is 30 inches between uprights by 20 inches high, and the table is 6 feet long.

The manufacturers are H. B Smith Machine Co , Smithville, N. J.

Strength of Spur Gearing.

By J. C.

Mr. Grimshaw, (Am. Machinist March 25,) gives a very convenient scale diagram for the proportions of the teeth of spur gearing, to which is attached a column of figures representing the lbs. strain per inch of face the teeth may be relied on to transmit. I cannot conceive how so low an estimate can be formed for the strength of the teeth, it being about one-fourth of the actual working strain to which the most severely-tested mill-gearing is continually subjected in current practice, with properly designed machinery.

The proportions for gearing given to us by the early millwrights have no application in modern first-class practice; in fact some of the rules seem actually meaningless.

This probably arises from several causes, prominently the following:

The gearing of half a century ago was frequently applied to a combination construction of wood and iron. The castings were probably weaker than those now made. The structures were often of crude design, possibly ill proportioned wheels on improperly supported shafts, so that the alignment was subject to frequent derangement—a combination of qualities fatal to the operation of toothed gearing.

Going back to Tredgold's time, we find this eminent mechanic formulating his experience by rules which allow no adequate value for the breadth or face of tooth, and limiting the pressure on the teeth to 400 lbs. per inch of face for any pitch from one inch upwards. His rules are quoted hesitatingly by such high authorities as Fairbairn and Rankine, and partially improved, and are found in several modern books of reference.

The most recent writers on the subject offer rules too much biased by the "practical considerations" of the mill-wrights of the past generation, and give results much below what is now continually attained, with well-made gearings, of good material, borne on shafts of suitable strength, and properly supported. To this class of mechanism alone, the following remarks are applicable.

It having been a part of the writer's duties in past years to construct mill gearing of the heaviest kind, it was made a duty to ascertain with approximate accuracy the strains safely transmitted, and also, in several instances, strains under which teeth fractured. These results were collated and the formulas and tables given hereafter were established, in harmony with practice as well as theory Considering the tooth as a beam whose depth at the root equals one half the pitch, and the load concentrated on one tooth at the pitch line, also the distance from pitch line to root of tooth equal to $\frac{A}{15}$ of the pitch; we have by the well-known formula for beams,

$$WL = \frac{CAD}{6}$$

where W=breaking load in lbs., L=distance from pitch line to root of tooth, A=area of tooth at the root, D=thickness of tooth at the root and C=a modulus for cast iron, which for ordinary castings may be taken as 36,000. We can deduct from above considerations that the static breaking load in lbs. for a tooth, equals 3700 × Pitch × Face in inches. But cast iron is a material of uncertain elasticity, and we have to allow a large margin for this defect, as also for a reasonable amount of wear, before the gearing requires renewal. We have also to keep the pressure per inch of face within limits which have been determined by experience.

Before determining what factor for safety he should allow, the mechanic must first consider the character of the strains the gearing under consideration will be subjected to. With this intent, gearing and kindred parts of machinery might be classified in four divisions, as follows:

Class 1. Slow speeds; power equally applied being the greatest loads the machinery should be subjected to under the most favorable conditions. Factor of safety, 5.

Class 2. Moderate speeds; power freely communicated, but without the intervention of fly wheels or similar accumulations of energy. Factor of safety, 6.

Class 3. Strains suddenly applied with considerable shock, such as in shears, punches, and ordinary mill gearing. Factor of safety, 8.

Class 4. Strains suddenly reversed in direction, with severe shock. Factor of safety, 10.

The above gives the safe working loads in pounds for the different classes, as follows:

Class 1=750 × Pitch × Face.
Class 2=600 × Pitch × Face.
Class 3=450 × Pitch × Face.
Class 4=300 × Pitch × Face.

The following table indicates the safe working load per inch of face for pitches from 1 inch to 4 inches; any other pitch being in proportion:

Pitch in inches.	Working loads in lbs. per inch of face.			
	Class 1	Class 2	Class 3	Class 4
1	750	600	450	300
2	1500	1200	900	600
3	2250	1800	1350	900
4	3000	2400	1800	1200

These rules have been used by the writer in his practice for several years, with good results, and are offered as trustworthy.

For the satisfaction of any who may think the figures too high, the following instances are cited of gearing in constant operation for several years. Teeth of one inch pitch on a hand power crane loaded 600 lbs. per inch of face. Teeth of two inches pitch on a shears strained 1100 lbs. per inch of face. Teeth of four inches pitch on a powerful shears, strained 2,000 lbs., and occasionally 2,500 lbs. per inch of face.

On a large press, teeth of 2¼ inches pitch, 8 inches face, broke on two occasions, under a strain as near as could be estimated of 1,700 lbs. per inch of face, but had repeatedly been subjected to strains of 1,300 lbs. per inch of face, without injury.

For mortise wheels, having teeth of well seasoned hickory or locust, or similar suitable material, calculation based on the ultimate strength of the material, gives only one-third of the resistance of cast iron of the same pitch. But the wood is much superior to cast iron in comparative elasticity, and it is found to wear better under moderate pressure. Much higher factors of safety are therefore allowable.

The pitch of mortise wheels can be safely made from one and a half to twice the pitch estimated for cast iron.

Regarding the proportion of face of tooth to pitch, common practice is from three to four times. It is best when the wheel overhangs its bearings, or when it is not supported closely at both ends, to limit the face in about these proportions, but otherwise there is no limit required.

Building is likely to be very brisk this season and more expensive than for several years past. Both materials and wages have advanced considerably.

Combination Coupling for Wrought Iron Pipe.

In putting up wrought iron pipe, especially if of considerable size, a difficulty is experienced in adjusting the fittings to carry the pipe at the exact angle required, and at the same time to keep the joints tight. It not infrequently happens that it is found necessary to turn a fitting on the thread, from the point to which it was screwed, in order to correct the alignment of some branch pipe,

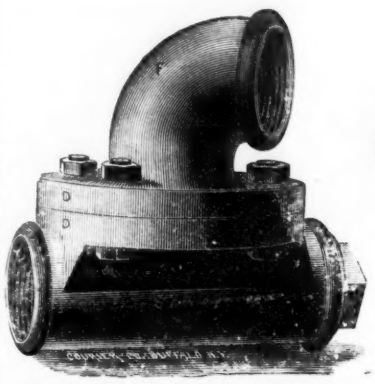


Fig. 1.—Combination Coupling.

the result being usually to develop a leak between the threads of the pipe and the fitting; or it frequently happens that it is desirable to change the alignment of some part of a system of pipes after they have been in use, a job that is sometimes done at considerable expense and inconvenience.

The object of the device represented in Figs. 1 and 2 is to provide a universal flange fitting of any description, which, when in place, can without delay be moved to accommodate a desired change in this respect.

Fig. 1 represents a combination Tee and Ell coupling. It will be seen that the Tee is provided with a fixed flange D, while the flange represented on the Ell, F, is loose, as clearly shown in Fig. 2. The flange of the Tee has a V groove sunk in its face at A, into which the projecting lip B is fitted steam tight by grinding.

By loosening the binding bolts that clamp the two flanges it will be readily seen that the Ell may be turned any part, or entirely around.

As previously stated, this construction is applicable to all kinds of fittings.

These fittings are manufactured by Barclay, Giebner & Co., Bradford, Pa.

The Association of Proprietors of Steam Engines, in the North of France, have made numerous experiments which show that many of the bricks that are employed in building furnaces are so porous as to allow an easy passage for air. In consequence of these experiments, they advise that no bricks should be employed for the purpose which are not very compact and refractory, and that they should be either glazed upon the outside or covered with an impenetrable varnish.

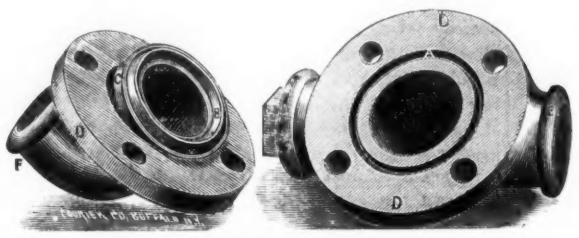


Fig. 2.—Combination Coupling.

Shop Kinks.

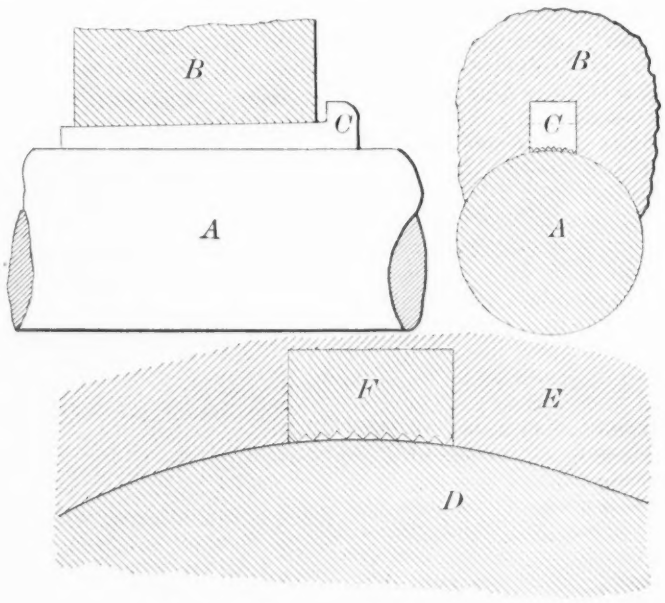
No. 29.

By L. F. Lyne.

METHOD OF KEYING ECCENTRICS AND PULLEYS.

The solid collar for application to the bottom of tool posts shown in Fig. 7, in Shop Kinks No. 27, published in the American Machinist of March 18, 1882, I find is patented. I was not aware of this fact before, and had never heard of its being used by any one besides myself; however, since the publication of my article, I have been informed that such is the case. This is one of those peculiar experiences which occasionally happen where two investigators in their endeavors to accomplish a certain result employ precisely, or very nearly, the same devices. The device patented is a solid collar upon the lower end of the tool post, for increasing the bearing surface upon the collar, as well as upon the flanges of the slide. But I am of the opinion that a collar made in two pieces, held together by rivets, as shown in Figs. 5 and 6, accompanying my article referred to, may be used without infringement of the claims patented.

The keying of an eccentric to a shaft, so that it can be easily shifted when required, is a somewhat difficult matter, particularly in the instance of locomotives, where there are key ways already cut in the axle. After the engine has been run awhile, and the shape of the eccentric becomes changed, it will be found after repairs have been made and the eccentric straps refitted, that the eccentrics will have to be placed in new positions to bring the valves right. These changes will necessitate the making of offset keys, which, when fitted and put in place, very seldom bring the eccentric in the exact position desired. In some instances I have known the key ways in the axle to be plugged and finished over, and after the positions of the eccentrics have been determined, flat places filed on the axles and the keys driven tightly to hold the eccentrics from turning. The effect of this method of keying eccentrics is, when the key is driven tight enough to do any good (which must be very tight) it will spring the eccentric, so that it will bind in the strap and is generally liable to heat, causing a great deal of trouble. I have seen keys fitted in this way, and driven by an incompetent workman, so that the key touched the axle only upon one corner, and if the eccentric was inclined to slip, it would loosen the key; or in other words, the driving of the key in this way had a tendency to roll the eccentric in the wrong direction.



Keys for Pulleys and Eccentrics.

In order to test the reliability of this method, after the eccentric was keyed fast, I have applied a large wrench, and, by the application of a moderate amount of force, have moved the eccentric. I have seen large pulleys keyed to shafting in the same way, and, when a sudden strain was thrown on one of these pulleys, the hub was split, allowing the shaft to rotate in the hub of the pulley. By merely flattening the shaft and driving a key, there is no shoulder for the key to bear against; nor is there any possible chance for the key to get a grip upon the shaft to hold the pulley from slipping. Furthermore, it will be seen that a tremendous strain is exerted by a leverage to burst the hub of the pulley; and, where there is an unsteady motion or "backlash," the pulley is quite likely to be worked loose. Some builders of locomotives put two dies of ⅞" in diameter and ¼" thick under the set screws in each eccentric. These dies have teeth cut in them running parallel with the axle, and are fitted to its curved surface. They are then tempered, and pins are inserted in them to operate in slots, which prevent the dies from turning. The set screws being tightened upon these dies, press the sharp teeth into the axle, and hold the eccentrics tolerably well. It is advisable, however, in most instances, to have a key in each eccentric, in addition to the set screws. I have used a key for this purpose, made as shown in the accompanying engraving, with remarkable success. A pulley, having a key way cut in the hub B, is placed on the shaft A. The steel key C is then made to fit the surface of the shaft, and to bear slightly harder at the center of the hub, in order to draw the hub squarely against the shaft; otherwise the pulley will be liable to wabble. After fitting, the key is taken to the shaping machine or planer, and a number of teeth are planed in it, as shown at C, in the sectional view. The key should then be given a moderate temper, and driven moderately tight. For keying locomotive eccentrics the same plan is used, which is shown in the full-sized engraving, where D represents the axle, E the eccentric and F the key. This key has an advantage over the dies previously mentioned, in having teeth running the entire width of the eccentric, instead of only ⅞" in length; hence it will hold better than the dies. I am aware that this style of key has been used in some instances outside of my own experience, but it might be used advantageously more generally than it is.

The regular spring meeting of the American Society of Mechanical Engineers, has been postponed to Wednesday, April 19th, at which time a two or three days session will begin.

We see it stated that belts made from mineral tanned leather are not only cheaper, but considerably stronger, than those made from leather tanned by the usual process.

A belt was made in Berlin lately, 6 feet 3 inches wide, and weighing a ton and a half. It required 200 of the largest and heaviest ox hides to make it, and its cost was over $4000 The belt is to be used for a starch factory and is to transmit 500 horse power.

Regulations for the Use of Electric Lighting Apparatus.

The following specific regulations have been prepared for the use of the Boston Manufacturers' Mutual Fire Insurance Company by the inspectors of that company, C. J. H. Woodbury and W. H. H. Whiting:

DYNAMO MACHINES.

Dynamo machines should be located in dry places, not exposed to flyings or easily combustible material, and insulated upon wood foundations. They must be provided with devices capable of controlling any changes in the quantity of the current; and, if these governors are not automatic, a competent person must be in attendance near the machine whenever it is in operation.

Each machine should be used with complete wire circuit, and connection of wires with pipes, or the use of ground circuits in any other method is absolutely prohibited.

The whole system should be kept insulated, and tested every day for ground connections at ample time before lighting, to remedy faults of insulation, if any are discovered.

Preference is given for switches constructed with a lapping connection, so that no electric arc can be formed at the switch when it is changed; otherwise the stands of switches, where powerful currents are used, should be made of stoneware, glass, slate, or some incombustible substance, which will withstand the heat of the arc when the switch is changed.

WIRES.

Any conducting wire which is warm to the touch, in comparison with another wire, is liable to become a source of danger, and should be replaced by a larger wire. Conducting wires should be secured to insulating fastenings, and covered by an insulation which is waterproof on the outside. Whenever wires pass through walls, roof, floors or partitions, or where there is a liability to abrasion, or exposure to rats or mice, the insulation should be protected with lead, hard rubber, stoneware, or some other satisfactory material.

Joints in wires should be securely made and wrapped; soldered joints are desirable, but not essential.

Wires should not approach each other nearer than one foot, and twice that distance is preferable in conducting electricity of high tension. Care should be taken that wires are not placed above each other in such a manner that water would be liable to make a cross connection.

The chances of a broken wire should be everywhere provided against by securing the wires on suitable insulators; avoiding danger from an accumulation of lint, by placing them one-eighth to one-quarter of an inch from the walls, ceilings or beams, except where necessary to lead to the lamps, and in all cases avoiding loops of wire, or leading it across the space from beam to beam.*

A cut-out should be placed in the circuit outside of each building, in a well-protected and accessible place.

ARC LAMPS.

The lamp frames and other exposed parts of lamps should be insulated from the circuit. Each lamp should be provided with a separate hand switch, and also with an automatic switch, which will close the circuit, and put the lamp out whenever the carbons do not approach each other, or the resistance of the lamp becomes excessive from any cause.

The light should be surrounded by a globe, and, when near combustible material, this globe should be protected by a wire netting. The globe should rest on a tight stand, so that no particles of melted copper or heated carbon can escape. Broken or cracked globes should be replaced immediately. Unless the globe is very high, and closes in as far as possible at the top, it should be covered by some protector, reaching to a safe distance above the light. Flat sheets of metal or wire gauze should not be used for this purpose, because flyings will collect upon such places when the lamps are not in use.

The lamps should be provided with some arrangement or device to prevent the lower carbons from falling out, in case the clamp should not hold them securely.

INCANDESCENT LAMPS.

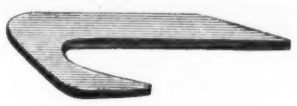
The small wires leading to each lamp from the main wires should be very perfectly insulated, and, if separated or broken, no attempt should be made to join them while the current is in the main wires.

The conducting wires leading to each building should be provided with an automatic switch or cut-out, or its equivalent, capable of protecting the system from an excessive current of electricity.

*It is important that wires parallel to each other, one above another, upon the same surface of wood, should be avoided in buildings constructed like those insured by this Company, for the reason that water used in washing floors, and water condensing upon walls in bleacheries, dye works, paper mills, or print works, may trickle down from one wire to another, thus making the conditions upon which a cross arc may be formed. This danger would be greater from acid or alkaline water destroying the insulating covering. It would therefore be preferable that all wires to arc lamps should be carried on one surface, and the wires from the lamps upon another; this mode may require a little more wire.

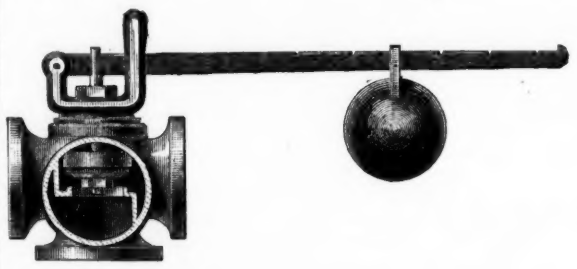
Perhaps the best method would be to keep the main wires upon the walls of the mill, and where they are carried to and from lamps, to place the wire *to* the lamp upon one beam, and the wire *from* the lamp upon the next one.

These suggestions are put in the form of a note to the Regulations, because the circumstances vary in different mills, or works, but managers can apply the reasoning on which these suggestions are based, to their respective conditions.



Wire Fence Nail.

The little engraving presented herewith represents a cut nail for use in putting up barbed wire fence. This nail is made by the Wareham Nail Company. The object of the designer, C. W. Deane, South Wareham, Mass., was to produce a nail that could be rapidly made by suitable machinery, and that in use should be superior to the wire staple ordinarily used for this purpose. This nail serves all the purposes of, and can be much more readily driven, especially in hard wood, than the staple, which of course expedites the putting up of the wire. The engraving correctly represents the form of the nail, which is such that it can be cut from the stock with but trifling waste of material, and also such as to be driven without danger of crippling, or in any way interfering with the hook.

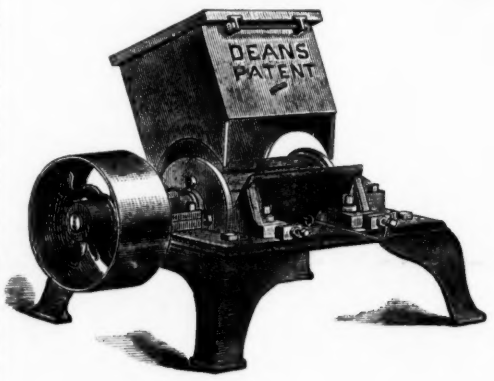


Improved Safety Valve.

The engraving represents an improved safety valve, the design of the manufacturers, Jenkins Bros., of 7 John street, New York, and 104 Sudbury street, Boston, being to furnish a safety valve that shall not be open to the serious objection of sticking from corrosion or other causes.

It is well known to engineers that the ordinarily constructed safety valve frequently, and especially when not in constant use, sticks to its seat so as to take a considerable pressure to release it, which pressure in the boiler, added to that necessary to overcome the weight on the lever sometimes results disastrously.

This safety valve does not differ materially from others, except in the composition of its seats, which are of what is called burnt rubber. This material we are told is nearly indestructible, readily standing a steam pressure up to 200 pounds per square inch, and at the same time it is said to be slightly yielding under heat so as to be tight under all ordinary conditions. The especial point, however, to be gained is the providing of surfaces that will not corrode, or become stuck together. In addition to this it is said the material is cheap and, that should it become necessary, the valve can be thoroughly repaired without removal.



Crushing and Disintegrating Mill.

The engraving herewith presented represents a mill made by Wheeler & Heyer, St. Johnsbury, Vt. It is said that this mill will reduce assorted kiln-dried bones to the consistency of flour. It is used for the manufacture of bone meal, as fed to horses, cattle and fowls, for which purpose the material needs no preparation whatever. It is also used for grinding oyster shells, phosphates, guano, charcoal, feed corn, and, in fact, for pulverizing or grinding any kindred substance.

As will be seen, the mill proper is mounted on a bed which is made in one piece, and to which the parts are bolted. In front of the cylinder is an adjustable chute, provided with stationary grinding cutters. The revolving spindle is fitted on its periphery with steel bars or cutters, between which and the stationary cutters the grinding is done. The shaft is $2\frac{1}{4}''$ in diameter, and runs in boxes 7" long.

This mill is run at high speed, from 1,000 to 1,200 revolutions per minute, requires about five-horse power to drive, and will grind from 3,000 to 20,000 pounds of material (depending on the quality) per day.

Another member of the New York Legislature has sent his pass back to Vanderbilt. He sent it back to have it made out for his family, instead of for himself alone.—*Cincinnati Saturday Night.*

The Milwaukee and St. Paul Railroad Co. is building shops in Minneapolis, Minn., calculated to employ 2,000 men, and the Minneapolis and St. Louis Railroad Co. has nearly completed three shops, each 100 feet square. Machine industries in that city are progressing at a very rapid rate.

Improved Boring and Turning Mill.

The engraving on page 5 represents an improved boring and turning mill for use on pulleys, mill gearing, water wheels, and work of a similar character. It is strongly geared and driven, to adapt it to heavy work. The live spindle has a long and large bearing extending to the floor, and is fitted to a steel step, so arranged that with a single turn of the screw, the head of which is shown near the bottom of the engraving, the annular bearing of the face plate is entirely relieved. When boring, turning, etc., the face-plate bearing is in V-shaped grooves at the extreme outside, which gives it great rigidity.

To provide for lubrication this bearing is provided with a self-oiling arrangement.

The dead spindle is bored out to receive boring bars, which are held steadily by rings recessed into the face plate.

The gearing is all cut, the feed is automatic in every direction, and is arranged to be quickly changed or reversed.

This boring mill is built by F. P. Michel, Rochester, N. Y.

LETTERS FROM PRACTICAL MEN.

Preparing Work on the Lathe—Center Reamers, Etc.

Editor American Machinist:

I notice in your issue of March 18 an article by Mr. Geo. B. Foote on squaring up work on centers. He says: "Don't leave any burr or tit. This is easily done by slacking up the dead center, after running the side tool close to the center; in this way the work will ride over on the tool and take off the burr." I am led to believe that he has never used a half center such as I described in the American Machinist of December 10, 1881. If so, he would never advocate the method he does. I believe that if he, and every one else that have never used a half center, will make and use one once, they will never go back to the old-fashioned way of squaring up work by slacking back the dead spindle.

It is often the case that the work is so small that when filing it the file will strike the large part of the center, making it impossible to file the work on the end. Now, by bringing up the part of the center which is milled away, the file will have a chance to pass over the end of the work.

Another device, in the form of a lathe-center not often found in a shop, is the female half center. It often happens that a small tap is to be made. Instead of centering this small piece, chamfer one end like a center by holding in a small chuck. By placing this end in the female center and the other end in a chuck, it will be found much more convenient than holding in the old way. Again, there is work, such as small spinning spindles, that has to run on the point, and on some part is to be turned for the pulley. For doing such work this center is almost indispensable.

I am not willing to admit that Mr. Foote is up to the times in his way of making a center reamer. He says: "Flatten one side from the point back to heel, not quite one-half the diameter." Where he, as well as a great many others, make a mistake is in filing back, as shown, for cut and clearance.

I have two objections to this way of making a center reamer, which I will try to make plain to your readers. When made as he describes, just as soon as it becomes dulled the workman grinds it to sharpen, and in so doing the cutting edge is ground back of the circle upon which the reamer is cutting; therefore it brings the lower part of the reamer to bear, and it will not cut. Now, to make it cut again, the circular part of the reamer must be ground away until the cutting edge is made to bear on the circle, and this grinding speedily destroys the shape of the reamer.

To make a center reamer, proceed as in making a center, and mill or file down $\frac{1}{64}$th of an inch *below* the center. Then temper, and the reamer is ready for use. No other clearance is needed, and it can be ground on the flat side without changing its shape or its utility. I think if Mr. Foote or any one else will make and use a reamer of this kind, he will never willingly use a half-round reamer made in any other way.

C. E. Simonds.

Grant and Bogert Machine Tool Works, Flushing, L. I.

Keeping Drawings in Order.

Editor American Machinist:

When compelled to roll drawings, roll them backwards—that is, with the backs turned inward. If rolled in this manner the ends do not curl up but down when the drawings are placed in the drawer, therefore do not get torn the next time the drawer is opened. The sheets soon resume their original flatness. Fred. A. Halsey.

New York.

Information of Shop Devices.

Editor American Machinist:

H. R., in your issue of March 11th, says the step reamer I described in one of my articles has been in use at Colt's for the last ten years. This proves that it is useful, at least. I have no patent on it, neither did I expect to try for one, therefore I am not going to worry over the fact of its not being *new* in Colt's, but I still believe it will be new to a great number of your readers.

It has been about eighteen years since I was in Colt's, and I believe that they have in use many devices which are new, or would be new to the trade, if described; and, for one, I would be glad if H. R. would describe some of them in your columns. I think one of the best features of your paper is the fact that you publish practical descriptions of devices which are in use in different shops. Now, I *believe*, if H. R. will visit different works, he will find that in Colt's there are many devices which are not in use in other places, and *per contra*, he would undoubtedly find many devices which would be new at Colt's. This is what I believe to be the great benefit derived from your paper—the bringing together of mechanics to exchange ideas.

I will be extremely sorry if, in any of my articles, I happen to advance some idea which I believe to be new and find that any one is disappointed because they have seen or used it before.

Geo. B. Foote.
Helena, Montana.

Steam-Engine Economy.

Ed. Am. Machinist:

H. F. F., March 18, will allow me to suggest that it was not "the little query" which he raised that I objected to, but the *spirit* with which he apparently "tacked it to my communication."

It would be more interesting to your readers generally if certain correspondents would make fewer blank assertions, accompanied by no reasons to support them. "Perhaps," "I believe," "I don't believe," "probably," etc., do not carry conviction with them, and as they have dropped out of sight for want of a support, I shall have to pass them.

There is either a misunderstanding between me and H. F. F., or he is talking simply for the purpose of keeping the subject agitated.

It is news to me to be informed that "the discussion is on a 14″ cylinder at 373⅓ feet piston speed." The point which I have endeavored to show from the start is simply this: That after all the conditions are settled upon, except the proportions of the cylinder, then less condensing action will be obtained by a cylinder, whose stroke equals two diameters, than by any other proportions. I took his 14″×14″ cylinder simply because he held it up as an example, and I showed him a cylinder (11″×22″) which has less condensing action (which he admits, and this establishes my point as far as he is concerned) than the 14″×14″ cylinder, both developing the same power under like conditions. Whatever changes H. F. F. may make in the proportions of his cylinder, as long as he does not make the stroke equal to two diameters, I can make a cylinder, doing the same work under the same conditions, which will condense less steam.

I fail to see any force in his objection to an increased piston speed in the 11″×22″ cylinder. If it is an increase in the wear of the piston he objects to, then I can claim a corresponding reduction, if not more, in the wear of other parts of the engine, in consequence of a reduction of the pressure upon the bearings.

In comparing the condensing action of two cylinders, we must compare them at the same *rotative speed*, regardless of piston speed, since the *time of contact* of the steam with the surfaces depends altogether upon the former.

He compares his 14″×14″ to "my 14″×28″ cylinder," and proceeds to show me a fact which has been prominent in my reasoning from January 28 to the present time. He seems to think that I claimed that a 14″×28″ cylinder contained the least condensing surface of all 50 horse-power engines that can be built, which is far from it, and I never even dreamed of claiming such an absurd thing. The 14″×28″ cylinder was simply the result of an example, illustrating the rule I gave for finding the diameter of a cylinder when it should be desirable to make the stroke equal to two diameters, that is:

$$\tfrac{1}{2}\,S = D = \sqrt[3]{\frac{126050 \times H}{P \times N}}$$

in which S=stroke, D=diameter in inches, H=horse power, P=mean effective pressure and N=number of revolutions per minute.

If H. F. F. had analyzed this equation, as well as the causes which I gave, in plain English, for the loss of heat, he would have seen that these, in the broadest sense, take into account the boiler pressure; point of cut-off, comprehending heavy and light loads; *rotative speed*, ratio of diameter to stroke. In illustrating the rule I simply, for the sake of a convenient example, supposed these conditions to have been predetermined and fixed upon as given, viz.: H=50, P=30 and N=80; applying these data to the formula I obtained a 14″×28″ cylinder as having less condensing action than any other cylinder working under the *same conditions*. But almost any machinist knows that the condensing action can be reduced still further by changing the original conditions. This, H. F. F. took the liberty to do, by changing N from 80 to 160 and then he boldly held up the result (14″×14″ cylinder, obtained by a method of his own) as a proof that my conclusions were altogether wrong. I accepted this change of condition and with the new data thus given me, I obtained a 11″×22″ cylinder as having the least condensing action under the new conditions, and, as he says, 6 per cent. less than his 14″×14″ cylinder which he held up to prove the fallacy of my reasoning. I should consider this a very good saving indeed.

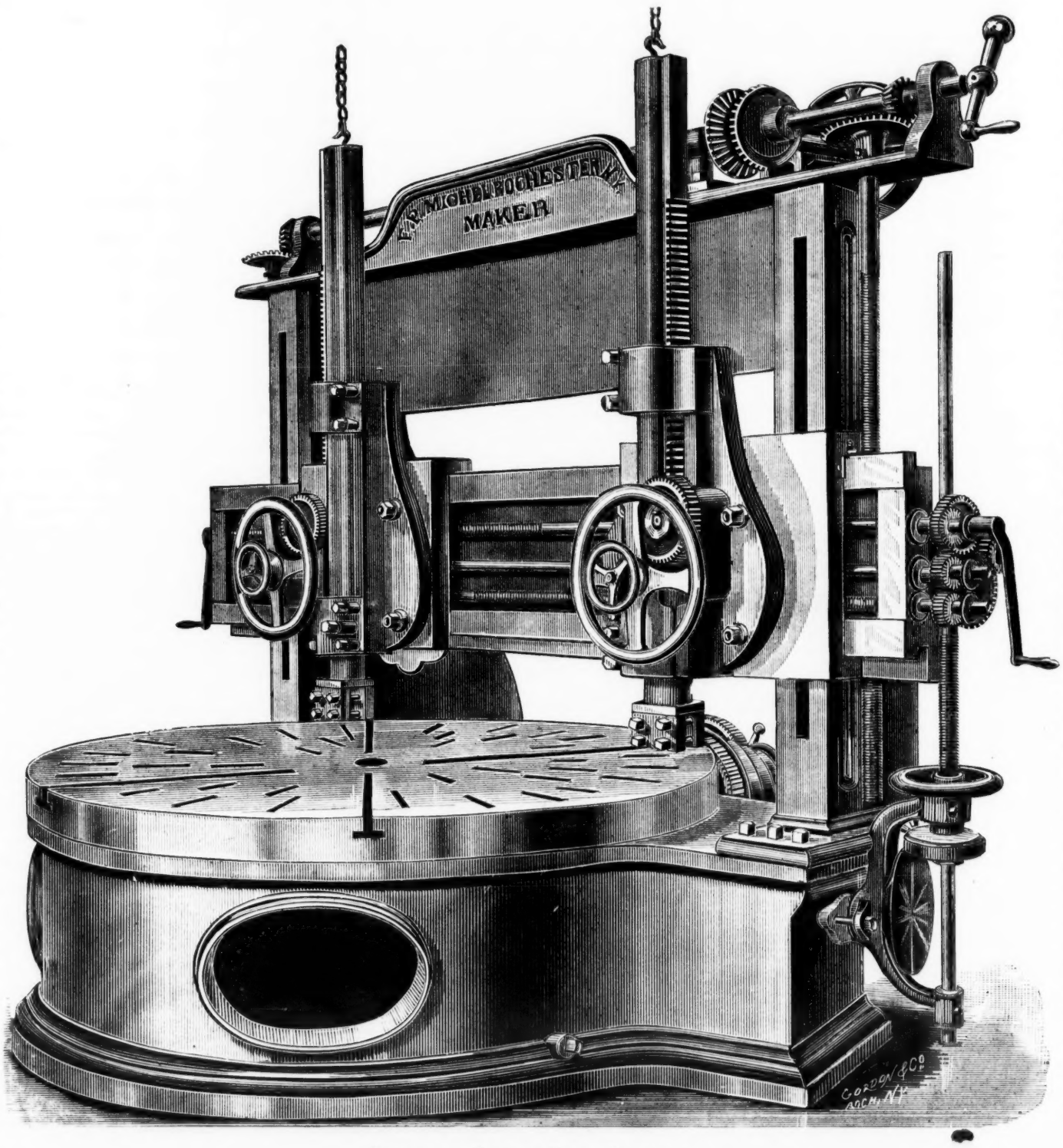
To introduce the *least possible* condensing action in the cylinder we would have to determine: First, the power needed and fix this as low as the circumstances would permit. Second, we would fix the boiler pressure just as high as circumstances would allow. Third, we would settle upon the highest rotative speed practicable, and fourth:—

Well, what fourth? I suppose H. F. F. will say, assume the diameter and determine the stroke, or, assume the stroke and determine the diameter. "*And fourth*" is where my discussion commenced on Jan. 28, and this is all I pretend to discuss. All previous to the "*fourth*," I took for granted that everybody knew what influence these would have in the case, and therefore made no direct mention of those conditions, until drawn into these side issues by H. F. F.

It has been suggested that very little is known about condensation. This is true in an absolute sense, but we do know that the condensation which results from the *loss of heat* takes place upon the internal surfaces of the cylinder, and is influenced by the extent of these surfaces. The best authorities we have upon the subject, give the loss, due to condensation, as being greater, in some instances, than the steam required to do the work of the engine.* Knowing this, gives me all the facts I need to support the idea which was advanced in my first paper.

I have already taken up more space than I intended, so I will drop the subject here.

C. A. Smith.
Providence, R. I.



Boring and Turning Mill.—See page 4.

Position for Cutting Point of Tool when Turning Tapers.

Editor American Machinist:

Amongst machinist "jours" and "apprentices," alike, is the habit, probably as old or nearly so as the "trade" itself, of discussing in leisure moments various questions relating to mechanical subjects. These questions are often started by the apprentices and they, failing to agree, submit the point to some "jour" of good repute, and so the older workmen are drawn into the discussion, and in many cases the result of their arguments leaves the apprentices in doubt, as they were when they put the disputed question to their

* Prof. Rankine on *The Steam Engine*, page 421. Also, D. K. Clark, in *A Manual of Rules and Data for Mechanical Engineers*, pages 879-890. See also *Railway Machinery*, by the same author.

superiors in experience, if not in theoretical knowledge. The fact remains, that on many problems of this nature our experienced machinists and mechanical engineers disagree, for proof of which read the AMERICAN MACHINIST. One of the old disputed questions in the "shop" is: "In setting the cutting point of tool for turning tapers does it make a difference whether it is in the same plane, or level, as the centers of lathe, or whether it is placed at any point above the plane of centers?" It is a well-known fact that in straight turning, the common practice is to elevate the point of tool above the level of centers and, naturally, when the machinist sets the tail spindle over to turn a taper the tool is set in the same position as for turning a straight or parallel piece. I do not remember to have seen anything in print relating to it until in the AMERICAN MACHINIST of Feb. 4th, current year, Geo. B. Foote of Helena, Montana, gave a very good article as I thought but it failed to convert some whom I know, and it occurred to me that a different showing might help some of the "doubters" on the right road, so with your permission I present the following explanations for Figures 1 and 2, each of which show plan and end elevation diagrams of taper piece in a lathe on centers "set over" for turning tapers.

It is proposed to show 1st, that the point of tool should be on same plane as the centers of lathe to turn a true taper. 2d, that when the point of tool is placed above (or below) plane of centers the taper not only changes with every cut over the piece, but the line of taper is a concave curved line instead of a straight line.

A, *B*, Fig. 1, is line of centers on lathe when set to turn straight; *C*, is line of tail or dead center set over $\frac{1}{8}$" from *A*, *B*.; *a*, *b*, *c*, *d*, a piece 3" long, $1\frac{1}{2}$" diameter at *a*, *b*, and $\frac{3}{4}$" diameter at *c*, *d*, turned by tool *K* with cutting point of tool at *g*, in same plane as centers of lathe on line *D*, *E*. Now we will suppose tool *L* with point at *h*, be put in and started on the $\frac{3}{4}$" diameter *c*, *d*, already turned by tool *K*, the tool carriage moves over the same track as before, that is, in the same plane and line. On plan the line is shown at *m*, *n*. The result is shown on end elevation with small end *F*, $\frac{3}{4}$" diameter due to radius *h*, *e*, and large end *H*, about $1\frac{3}{8}$" diameter due to radius *h*, *f*. On plan the general taper is seen at *d*, *c*, *x*, *y*. One more change and we put in tool *M* with cutting point at *i*, perpendicular over tail center *e*, this is started at $\frac{3}{4}$" end of piece, without reducing the diameter and moves in plan on line *o*, *h*, producing a taper the general form of which is seen on plan at *d*, *c*, 1, 2, and on elevation at *F*, $\frac{3}{4}$" diameter due to radius *i*, *e*, and large end at *I*, about $1\frac{1}{16}$" diameter due to radius *i*, *f*. The tool is shown in this diagram in the correct position with point at *g*, with a resultant taper of exactly double the "set over" of tail center, and a line of taper that is as near a straight line as is the one in which the tool carriage moves.

An extremely erroneous position of tool is shown with its point at *i*, and for the result with the same piece to operate upon, with the same "set over" to tail center, we have a piece $\frac{3}{4}$" diameter at small end and about $1\frac{1}{16}$" diameter at large end, the intermediate position of tool requires no further explanation. To illustrate the 2d part of the question under consideration we turn to Fig. 2, which imagine to be the same lathe with tail center "set over" $\frac{1}{8}$", same as in Fig. 1. The piece to be operated on 3" in length; the tool *N* is secured in carriage and cutting point located at *g'*, perpendicular over tail center *e'*. The piece is turned and we have as result a conical cylinder whose diameter at small end *F'*, is about $1\frac{9}{32}$", due to radius *g'*, *e'*, and at large end $1\frac{1}{2}$" diameter, due to radius *g'*, *f'*, and for a section of the cylinder midway its length we have circle *H'*, due to radius *g'*, *l*.; *l* is a point half way between *e'*, *f'*, on plane of centers *D'*, *E'*. Now transfer diameter of circle *H* to a point in center of length of piece *a'*, *b'*, *c'*, *d'*, we find it reaches points *v*, *w*, which are somewhat below the straight lines drawn from *a'* to *d'* and from *b'* to *c'*, and consequently the lines of this taper are curved instead of straight tapers. If any one doubts this let him take any taper piece whose sides are straight lines and test it with a good straight edge, first setting the straight edge over axis of taper piece to see if the sides have straight lines, then swing one end of same around out of line of axis, say as shown on line *s*, *t*, Fig. 2 plan, and the line of surface under straight edge appears to be, and is, convex. Now if the piece could be turned so that the edge in last position would lay fair the whole length, we have just the shape that may be turned by tool above plane of centers, but if the straight edge be now moved back to its first position over axis of

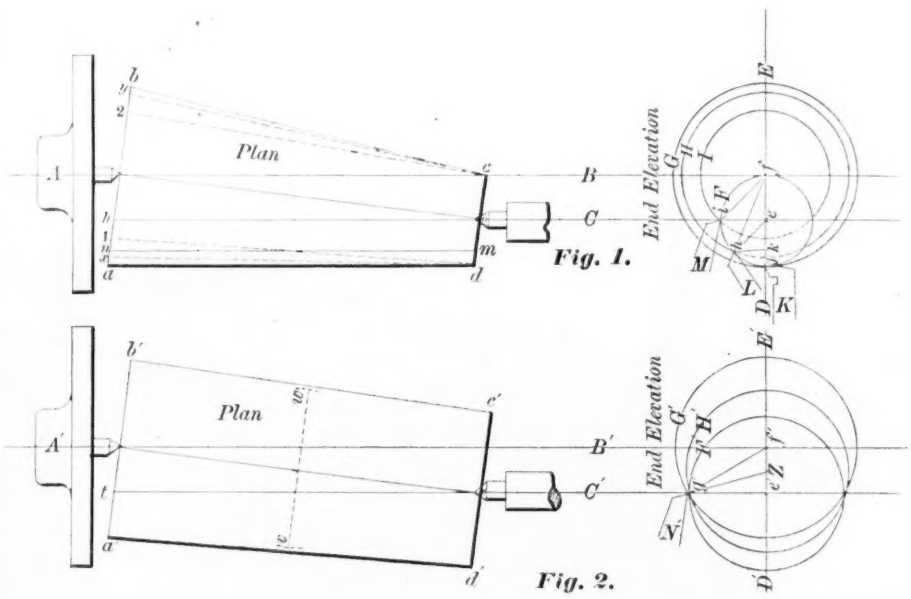


Fig. 1.

Fig. 2.

piece we discover that our taper piece has sides that are not straight lines but concave. In Fig. 2, with point of tool perpendicular over tail center, we have at small end a diameter of $1\frac{9}{32}$" and at large end a diameter of $1\frac{1}{2}$", a taper of $\frac{7}{32}$". Now as in Fig. 1, lower the point of the tool to *i* and we get $\frac{3}{4}$" diameter at small end and $1\frac{1}{16}$" diameter at large end, a taper of $\frac{5}{16}$", and these varying tapers are both got with tail center "set over" $\frac{3}{8}$". This shows conclusively that, with point of tool above the plane of centers, we not only do not get a taper piece with straight lines, but every cut that is taken changes the taper.

If any machinist will take a piece of iron, center and turn it taper with tools located at the above three points as shown, they will be convinced that the foregoing statements are correct; though he may not see why it is so, he must acknowledge the *fact*. Any other lengths or diameters than those given in this article, may be used; the greater the extremes, however, the plainer the results. These particulars apply as well to lathes whose centers are not moved "out of line" for tapers, (but get the taper from "formers," or "guides," set on taper,) as to the old fashioned and still common engine lathes in use in every machine shop in the country.

To sum up the whole question, there is but one position for the cutting point of a tool when turning tapers, and that is *on the plane or level of centers of lathe.*

A. S. ALDEN.

Holyoke, Mass.

A Lathe Dog.

Editor American Machinist:

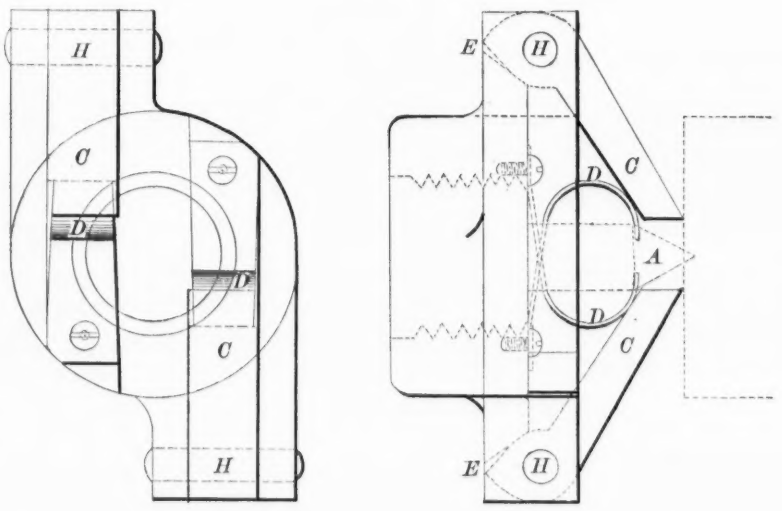
As a contributor to your valuable "Shop Kinks," I submit a drawing of a lathe dog or driver, devised by the writer about eight years ago. This tool replaces the usual carrier, and allows the tool to pass entirely over the work in the lathe, without any second handling or reversing of the piece under operation.

The tool is screwed on the lathe spindle in place of the face plate. *A* represents the lathe center, and *B* the work driven. *C C* are hardened steel pawls or drivers hinged at *H*, and held against the end of the work *B* by the springs *D D*.

The heels of these drivers are made as shown at *E* to prevent them from swinging outwards and inconveniencing the workmen. The drivers *C C* bite at once into the end of the driven piece without any preparation for that purpose. The drawing is half size of a tool used for driving rounds from $2\frac{1}{2}$" to 4" in diameter. The work driven by this tool was bridge pins, which were reduced 1-16" in diameter and finished the entire length at one cut without stop or change.

It will be observed that in action the drivers must exercise considerable thrust towards the dead center, but for light turning such as described, no inconvenience is felt. This tool is a useful adjunct to the lathe; was not patented, and is worthy of a trial by those engaged in work for which it is suitable.

PENCOYD.



Cylinder Condensation—Underloaded Engines.

Editor American Machinist:

I am glad to see the AMERICAN MACHINIST and its correspondents giving attention to cylinder condensation. I believe Mr. Isherwood puts the loss from this source at from 8 to 50 per cent. The report, which I have at hand, of the Hecker and Waterman experiments, in 1864, gives the loss, with steam jacket in use, at from 9.7 to 11.3 per cent., and without steam jacket at from 37.8 to 49.2 per cent.

The steam in the jacket was not furnished by the experimenting boiler furnishing steam for the engine, and I think it possible that the jacket condensation might have equaled that of the naked cylinder. I would like to try the experiment of reducing condensing surface by use of a smaller cylinder, and therefore less cut off, or even with no cut off at all.

Underloaded engines cause a great loss of steam, which has been referred to in the AMERICAN MACHINIST, but by whom I do not now remember. I have made some experiments in this direction, and can testify. One case was that of a 19" cylinder, with automatic cut off. The engine would do the work well with 20 lbs. of steam. The boilers were safe at 80 lbs., and the safety valves were set to blow off at that pressure. The driving belt was of ample width for the full power of the engine. I reduced the diameter of the driven pulley one-half, changed the governor pulley so as to run the engine at one-half its former speed, and told the fireman to keep the boiler pressure between 60 and 75 lbs. The result was a saving of 50 per cent. in fuel. If I had only had some patent fly trap to put on the engine at the same time, what a big thing it would have been for the fly trap.

Another case was in a foundry and machine works that I had then lately taken charge of, where I found a 11" cylinder requiring the use of 2,700 lbs. of coal per day. On examination of the boiler, I was surprised at its complete and admirable arrangement.

It was a common tubular boiler, but only 10 feet in length, and was arched over the top with brick, forming a return flue, so that the heat passed first under the boiler, then through the tubes and then back over the top of the boiler to the smoke stack. There was a good damper in the flue near the stack, and by closing this damper, and all front drafts, and shutting 40 lbs. of steam in the boiler at night, from 5 to 10 lbs. of steam would be found in the morning. Here was a strong hint on boiler condensation. Six years subsequent use of that boiler and its setting, convinced me that I had never seen a better arrangement.

The work was light, and 2,700 lbs. of coal per day was enormous. The exhaust showed that there was something wrong, either with the piston or the valve. It was a common slide valve. Examination showed that the packing rings were held tightly between the follower and the head, and that the exhaust port opened at half stroke of the engine.

These faults were corrected, and then the engine would do its work on 1,500 lbs. of coal per day. I carried from 60 to 75 lbs. of steam, although the engine would do its work with 25 lbs. Here was the old grievance, an underloaded engine. The belt passed through the walls of the building in such a way that it was not convenient to reduce the size of the driven pulley.

I had early been taught that I must never wire-draw steam, but I knew by experience, that I could save steam by throttling down, leaving just enough opening to do the work.

I concluded to throttle down with the main valve.

I put on a rock shaft with a long and short arm, reduced the throw of the valve until it took 50 lbs. of steam to do the work, and then the engine did its work well with 900 lbs. of coal per day.

Defiance, O. ANTHON.

Cutting a Chaser.

Editor American Machinist:

In your issue of March 4th, Geo. B. Foote explains a way he cuts a screw when in a pinch. I am thankful for the many practical ideas gained from Mr. Foote's letters and others found in your valuable journal. I think he could have gained the same end with less time and trouble, by making and using his index in the following manner: Fasten a piece of board of convenient size (the larger the more accurate the chaser) on the feed screw. Strike on this board a circle as large as can be made. Divide the circle into as many equal spaces as the number of threads to the inch you wish to cut. Mill the first groove with all the lost motion taken

up in the feed screw, and with a division of two spaces exactly under a fixed point. For the second groove, and every succeeding one, turn the circle round until as many spaces pass under the fixed point as there are threads to the inch on the feed screw. I think with a circle of large size very accurate results could be obtained.

MACHINIST.

Indianapolis, Ind.

Cost of Iron Castings.

Editor American Machinist :

I note in your issue of the 18th instant a communication stating that a firm in England have obtained an order for heavy castings at 2½c. per lb., and asking for information as to the cost of castings in that country.

I enclose you herewith a table, giving particulars of casts for three weeks during the year 1879, each week being taken from separate months, and showing a fair average of the usual run of work in that foundry.

These tables you will notice do not include charges for sand, flour, blacking, etc., and other general expenses necessary to run the business, which items should be covered by adding 25% to the net cost, bringing the average cost for the above three weeks, to cents, 1.37 per lb.

In making the table on next column I have taken the pound sterling as equal to $4.80.

The foundry was what might be fairly termed a general jobbing shop, very few of the castings weighing over 100 lbs., the principal part of which were for agricultural machinery; so that, with a shop where there is a general run of heavy work, the cost should be reduced. All the hands were required to work piece work, the prices being set at so much for each article, the men on plate-moulding machines being paid at per box. I have found that the general practice in foundries is to pay at per pound, but this system I do not approve of. I know that many will say that my way causes a great deal of bother; but if there is a foreman who thoroughly understands his work, and works systematically, the trouble is very little.

What will partially account for the difference in cost is the rate of wages, which, in the foundry I am speaking of, ranged from $6.25 to $7.75 per week of fifty-four hours, the average amount made by piece work bringing it from $7.80 to $9.50.

I also beg to call your attention to the amount of iron brought down for 1 lb. of coke, which is about 30 per cent. more than Mr. Kirk brings down, as shown in yours of January 18th, 1881. This, I think, will show that, if good coke can be obtained on this side, it is cheaper to use it than a mixture of coal and coke.

The iron was melted in a 26″ cupola, such as is ordinarily used in jobbing shops; the blast was only blown from one tuyere.

The first week's cast, which I have given you, was taken shortly after we began to look into foundry matters more closely with respect to the consumption of fuel; the second was a full week, taken two months later; the third contains two short days, which will account for the greater quantity of coke used.

T. J. BALDON.

632 Lagauchetiere, Montreal, Canada.

TABLE SHOWING COST OF CASTINGS FOR THREE WEEKS.

No. 1. WEEK ENDING JULY 17, 1879.

Dr.	lbs.	Per 100 lbs.		*Cr.*	lbs.	Per 100 lbs.	
Scrap Iron, }	21,168	@ 48	$101 61	Castings,	26,070		$281 08
Pig Iron,	13,776	@ 67	92 30	Sprues,	6,664	@ 48	32 00
	34,944						
Coke,	3,528	@ 27	9 52	Showing cost to be, cents, 1.08 per lb.			
Wages,			109 65				
			$313 08				$313 08

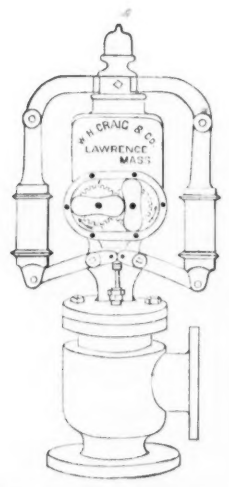
No. 3. WEEK ENDING NOV. 6, 1879.

Dr.	lbs.	Per 100 lbs.		*Cr.*	lbs.	Per 100 lbs.	
Scrap Iron,	16,184	@ 43	$69 59	Castings,	18,104		$194 85
Thorncliffe Pig,	4,900	@ 62	30 38	Sprues,	4,144	@ 43	17 82
Scotch Pig,	2,156	@ 78¾	16 98				
	23,240			Showing cost to be, cents, 1.07 per lb.			
Coke,	2,604	@ 27	7 04				
Wages,			88 68				
			$212 67				$212 67

No. 2. WEEK ENDING SEPT. 25, 1879.

Dr.	lbs.	Per 100 lbs.		*Cr.*	lbs.	Per 100 lbs.	
Scrap Iron,	17,136	@ 43	$73 68	Castings,	22,087		$253 11
Thorncliffe Pig,	6,832	@ 62	42 36	Sprues,	4,872	@ 43	20 95
Scotch Pig,	4,480	@ 70½	31 58				
	28,448			Showing cost to be, cents, 1.14 per lb.			
Coke,	2,716	@ 27	7 33				
Wages,			119 11				
			$274 06				$274 06

GOVERNOR WITH STOP MOTION.



OUTLINES OF GOVERNOR.

Bronze and Brass for Marine Purposes.

The contact of sea-water or of an electro-negative metal, says the *Engineer and Iron Trades Advertiser*, is a grave and constant cause of deterioration in bronze and brasses used in marine work; and the consequences may prove disastrous when such deterioration occurs in important parts, such, for instance, as the boss to which propeller blades are fixed. The English Admiralty, struck by the accidents proceeding from such a cause, ordered an inquiry, of which we here give the conclusions: Numerous bolts and rivets, made of the composition called marine bronze, having been analyzed after they had been in use, it was ascertained that quite a large proportion of their zinc had been dissolved. Pieces of cannon bronze having been exposed to the same conditions were found to resist exceedingly well. It seems, then, as a result of these facts, that if it were possible to find a forgeable metal of proper resistance and ductility, containing tin in its composition, a great and important point would be gained. Mr. Farquharson, president of the commission named by the Admiralty, proposed on this subject, in 1874, an alloy composed of 62 parts of copper, 37 parts of zinc and one part of tin. This is the reglementary alloy now adopted. When cast in bars it has shown on test a resistance of ten to twelve thousand kilogrammes per square centimeter. It rolls out and cuts well, can be hammered into sheets, and is fusible only above red heat, thus permitting of its being employed as a lining for engines. Finally, it is but slightly oxidizable, and is not sensibly attacked by sea water, as shown by experiments with it extending over a period of seven years. Its manufacture offers no peculiarity except the necessity of an accurate proportioning of the three ingredients, which should be perfectly pure. A slight loss of zinc during melting also has to be taken into account.

Hydraulic Governor with Stop Motion.

In our issue of May 21, 1881, we illustrated and described a new hydraulic governor, made by W. H. Craig & Co., Lawrence, Mass. We present with this an engraving representing this governor, as fitted with their new automatic stop motion; also a line engraving showing the pump, operating gears, etc.

The stop motion, as will be seen, consists essentially of a lever provided at the end with a pulley, under and in contact with which the governor belt runs. This lever is pivoted at its inner extremity in such a way as to leave the outer end and attached pulley free to drop by gravity, except when held up by the belt, as shown. In dropping the motion of the inner end of the lever operates to close the valve. From this it will be seen that, should the belt break, the engine will at once be stopped, thus doing away with the danger of accident from this cause.

This lever can be adjusted in any position to suit the angle of the belt, and when in position the pulley serves the purpose of a tightener, making the driving more positive.

For a detailed description of the operation and construction of this governor, we refer our readers to the issue of the AMERICAN MACHINIST mentioned above.

A Remarkable Locomotive.

It is sometimes assumed that improvements in the locomotive engine are not keeping pace with the improvements in other steam motors. We have always felt disposed to question this assumption, and hence it is with peculiar pleasure that we learn from the *Press-Eagle* that a most wonderful motor for railway locomotion has recently been constructed at Pine Bluff, Arkansas.

In the account of the trial trip of this locomotive, which was made in the building, and on two lengths of iron, we learn that after overcoming some trifling preliminary difficulties, of a nature not necessary to mention, "at a signal from Judge Bocage" (the builder of the engine), the steam was turned on, and the engine and truck glided smoothly and almost noiselessly across the room! Furthermore, "Upon the engine being reversed, the truck was instantly stopped and started in a backward direction!! This experiment was repeated time and again to the great interest of all present, and to the intense delight and satisfaction of Judge Bocage, who rightfully looks upon his oscillating engine as "one of the great bonanzas of the age."

Wonderful as all this may appear, it may be urged that engines have been previously constructed in which the intention to reverse, and even to run backwards, has been contemplated, which fact might cause some misgivings as to the entire novelty of the conception, if not the accomplishment of the purpose. Fortunately as to the *result* of the reversing process and the consequent intention to proceed in an opposite direction, there can be no question. We quote further: "By its use Judge Bocage claims that a train under full speed can be stopped at less than a car's length." Of course the distinct reference to a car settles the kind of a "train" alluded to; if not the assertion that: "In a measure it obviates the necessity for brakes"—which assertion is not particularly weakened by the concession that: "they (the brakes) will, of course, be used with the engine as a precautionary measure"—settles it.

The brake part of the subject isn't of the slightest interest, but the distance—it might be better to say the lack of distance—in which a train can be stopped is the strong point. It discounts, considerably, the best intentions of an Arkansas mule to part company with a rider.

It isn't necessary to enter into vulgar calculations as to the power required to stop a train of cars under full motion, because the mere assertion of the time, or distance, in which it can be done by this motor is sufficient to demonstrate that there are points about this engine that get it outside ordinary calculation, such as apply to every-day mechanical affairs.

It might be well, however, to suggest, as one of the trifles which possibly has been overlooked, that, unless there is some material difference between Arkansas railway trains at full speed and those of other localities, it would be advisable, as a second precautionary measure, to request the passengers to alight before proceeding to put the engine in operation to stop things. There isn't much doubt but they would view operations with rather more pleasure, if not with equal interest, at some little distance—say, about a half mile—from the scene of action.

The *Press-Eagle* promises further and extended particulars of this engine, which, it modestly says, "is destined to create a great commotion, if not an absolute revolution, in the motive power of the world, and make a fame and fortune for those who now possess the patent rights."

A new industry is said to be the pulverizing of rocks as an adulterant of flour, sugar and other necessities. Fifteen tons a day is the product of one concern.

M. Mennisier, a French gentleman, recommends a plan whereby vessels at sea shall be able to communicate with the main land. His proposition covers the laying of cables and the locating of buoys. These buoys are to be numbered and their location known from special tables. In the contemplated use of this system, when a ship is passing near one of these buoys, if it is desirable to telegraph the apparatus is connected in such a way as to use the buoy as an earth connection. In this way communication could be opened with a central station suitably established. It is claimed that a vessel in distress might get assistance from a ship passing near the next buoy. It is said the contemplated buoy is luminous by night, sonorous in a fog and accessible in any weather.

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NEW YORK, APRIL 8, 1882.

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Smoke Prevention.

Many manufacturing towns and cities are becoming interested in abating, in some way, the nuisance of smoke that results from the use of bituminous and semi-bituminous coal, by large manufacturing concerns. In some instances—notably in the city of Cincinnati—the employment of some means to prevent smoke, is made obligatory, as a result of which there are said to be already more than twenty devices offered in that city for the accomplishment of the end, and yet it is evident there is room for more.

Those only who have had experience in some Western manufacturing cities can form an idea of what, from being an inconvenience in the earlier days when the manufacturing was limited in extent, has with the rapid growth of such enterprise come to be a nuisance, both to the manufacturer and to the citizens generally.

The fact that at the present time manufacturers are, apparently, quite as much interested as others in the suppression of smoke, ought to, and undoubtedly will, go a good ways towards aiding in the application of means to the end in view, but the problem, as has been abundantly demonstrated, is a difficult one to solve. The perfect combustion of coal in the furnace of a steam boiler for the sake of the resulting economy, but more particularly with a view to prevent the distribution of unconsumed carbon where it is not wanted, has been for years the subject of much investigation, and no end of experiment in European countries, particularly in the large manufacturing towns of England, where, for obvious reasons, the extent of the trouble is much greater than in this country. Notwithstanding something has been done in this direction in these countries, it is plain the satisfaction is not complete, and that efforts in the same direction, have by no means ceased.

Since it is possible, experimentally, as in the laboratory, to entirely consume a given quantity of fuel, it would seem at first thought that the careful consideration of the means employed there, would point out the means to be employed in the furnace of a steam boiler for the accomplishment of the same purpose. Reasoning in this way, it has often been assumed that the subject of combustion was but little understood outside the laboratory of the chemist, but there is nothing to bear out such an assumption. The fact is, too little is known anywhere of the chemistry of combustion, and the chemist has added but little to the general useful knowledge of the subject. The ends usually sought in the two places—that of the laboratory and that of the furnace of a steam generator—are almost exactly opposite, or at least quite unlike. In the one instance, the end is the perfect combustion of a certain fixed quantity of fuel. To this end all conditions, as far as possible, are made subservient. In the other instance—that of the boiler furnace—the end sought is the liberation of heat sufficient for some useful purpose, the amount of which is, in the majority of instances, fluctuating. In this case, as in the other, all conditions must be subservient to the end in view. It is losing sight of this fact that has made nearly all attempts at smoke prevention, practically speaking, failures.

In the boiler furnace, as in the laboratory, it has been demonstrated that it is possible to consume all the fuel, at least to the doing away with smoke to any objectionable extent, if the fuel is burned to this end alone, but when burned, as it must be in the furnace, with the view to the generation of steam in just the required quantity, it is quite another thing. Under these circumstance, stoking has to be done *when* and *as* it must, without much reference to whether the result is smoke or perfect combustion.

As smoke is unconsumed fuel, or an evidence of waste going on, any means to prevent it should contemplate a saving in fuel; in other words the disposing of it should not contemplate an additional expenditure of heat, but should rather be made to add to economy in the utilization of heat represented by the unconsumed fuel that passes off as smoke. Or, to state it in another way, the effort should be in a direction to prevent smoke, rather than to the devising of means for consuming it after it exists. In this way, the advantage ought to be greater than the mere abatement of a nuisance.

Fortunately for the economic aspect, the only probable success is in the former direction—that of prevention; fortunately, because but little attention has been attracted to the absolute loss of scattering unconsumed fuel around the streets, until it becomes in its extent a positive nuisance.

Notwithstanding the difficulties in the way of accomplishing the complete combustion of coal in the furnace of a steam boiler, at such different rates as shall suit ever-varying conditions, it is too much to conclude that these difficulties will not be overcome. It is more than probable, however, that too much dependence is being placed on new devices and specific arrangements for accomplishing the object, and that too little use is made of existing knowledge, or too little attention given to adding in a general way to that knowledge.

There is little doubt that to accomplish the desired result, present construction or present practice—perhaps both—must be considerably modified. It is as useless to expect to cure a smoky furnace, that requires all the attention to the single feature of getting the required work from it to the exclusion of every other consideration, by the incorporation of some extraneous device, as it is to expect to find a single remedy for all diseases. Perhaps it is but a little more reasonable to expect success when the opposite extreme condition exists. What would seem desirable is a *flexibility* in the apparatus itself, that is, in the furnace and boiler, that shall admit of a ready adaptation to the varying conditions of demand, in such a way as to preserve the conditions attending the combustion of the fuel that are best suited to that end alone. If this is possible, there would be but little in the way of success; without this, success is hardly assured.

There is ample room for work in the direction indicated, with reasonable hopes for compensation in the event of success. To insure this requires a comprehensive grasping of the whole subject, and by no means as if it were a light one.

A Plea For Machinists, From a Machinist's Sister.

We have received the following from "a machinist's sister," which outlines from one point of view some of the ideas that are doubtless prominently in the minds of many of the young men who refuse to do well as mechanics, because they want to appear to be doing better in some other calling:

"It don't do a young man any good to tell people he is a machinist, if he wants to be respected in society," is the remark you often hear made by those following that avocation. Why this should so be, is not easily comprehended by those cherishing a sense of justice, or capable of appreciating the fruits of real genius.

Every branch of industry, whether manufacturing, mercantile, literary or mechanical, has to thank the fertile genius or skilled workmanship of the machinist for its existence or support. It is he who prepares the million spindles that buzz and whirl in manufacturing the various fabrics for the mercantile market; it is he who makes rapid transportation possible; it is he who constructs the printing presses that record the thoughts of literary genius; it is he who makes the telegraphic instrument that flashes our thoughts from country to country and from ocean to ocean. Without him all manufacturing would cease, for who then would repair the thousand little breaks that are constantly occurring about the machinery, or build the engines that furnish motive power for nearly all our factories?

Manufacturing is an important part of our nation's life, and to continue and improve this machinists are necessary, and expert ones, too. To secure these, not only good wages must be paid (which is usually the case), but also an equal social standing with clerks and students must be opened to them. No machinist with a truly American-born spirit will submit long to be ostracised from society, while young men in the office and drafting room with one-half the salary, one-quarter the genius, and no better gentlemanly qualities, are cordially welcomed into the social circle, and then look down with an air of contempt on "shop hands." A knowledge of the injustice of this state of things often creates either discouraged, reckless, dissipated tendencies, or an utter contempt for the unpopular craft and an engagement in some other business.

If the associations of the shop are rough, so much more do they need the polish of cultivated society to counterbalance this unpleasant circumstance. When we overlook our working classes and force them to enter the grog shops and barrooms for amusement and society, we degrade those who are the stability of society and who contribute most to our national welfare and home comfort. Ought not a man to be judged for his social standing by his moral character and intellectual abilities, rather than by the means by which he gains his livelihood? There are many among them, no doubt, who are unworthy the recognition of good society, as among all other trades and professions, but this is no reason why a young man with a liberal education and good habits, who chooses to utilize his tastes and tact for mechanical arts by engaging in mechanical pursuits, should be snubbed by his former associates, who prefer more indolent and genteel callings.

The difficulty with many of the young men, who are imbued with the feelings that our correspondent so freely shares, is that they are as liable to be in error regarding what constitutes good society, as are the members of the circle which they vainly sigh to enter, or in which they are anxious to remain, regarding the qualifications of many to whom they deny recognition. What constitutes good society? is a question that is capable of many answers. To say that society unites in turning the cold shoulder upon machinists, because they are machinists, is substantially to assert that society receives clerks, because they are clerks. There may be, and no doubt are, persons in what is ordinarily called "society" who are guided by such considerations. But to say that this is the rule seems to us at least open to question.

What is society, and for what purposes does it exist? Is it a body having as its object simply to define who shall or shall not be admitted into its charmed circle? We think not. Its object, for the most part, in our judgment, is much less complex and more rational than this. Whoever speaks of society speaks of himself and of his neighbors, and of everybody's neighbors. Society does not exist for the special purpose of searching out and rewarding merit, or of supplying compensations for hard conditions, any more than our correspondent is bound to select her intimate friends for reasons foreign to the domain of community of tastes and agreeable companionship.

The fact is, that portion of what is called society that is worth talking about, or having to do with, does not set out to admit clerks because they are clerks, or to reject mechanics because they are mechanics. In the main, if it admits clerks, it does so because the education, and manners, and neat appearance, and companionable ways and conversational qualities of these young men commend them to its taste. If it rejects mechanics, it is because they lack qualities which a young mechanic has no more excuse for lacking than a young book-keeper or clerk can have under like circumstances.

If our correspondent knows of instances wherein young mechanics, who possess the social and personal qualities that society demands, have been debarred from the privilege of showing that they possess those qualities, may it not be that these young men have been mistaken in their estimate as to what constitutes society and have been seeking admission into showy circles in which really good society would find little of either pleasure or profit?

For the young mechanics who allow feelings of the kind referred to by our correspondent to drive them into "the grog shops and bar-rooms for amusement and society," there is little to be said. For those of a different stamp, it is more than likely that many will live to be thankful that in their youth they struck the happy medium between society and social trifling, and devoted their energies to something more important than making merely society men of themselves.

Doubtless there are many young men whose educational advantages have not fitted them to appear to advantage in circles which

their tastes would lead them to enter. The young man who has such aspirations, and becomes conscious of his defects, has something better to do than finding fault with society. Let him apply himself to the systematic and determined correction of deficiencies of this kind, and the time will come when he will have something to present which society will be glad to accept, while rendering a suitable return.

Questions & Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(113) H. B., New York, asks: Is there a way to make bronze powder from scraps of gold leaf? *A.* Bronze powder is not made of gold. You can pulverize gold by grinding the leaves mixed with honey on a porphyry slab, with a muller. Afterwards wash the honey from the powdered metal.

(114) A. T., Portland, Me., asks: 1. How much should be allowed in making a shrink fit of a wrought iron crank to the shaft, the diameter of the eye being 10"? *A.* We should say 1-30th of an inch if the hole and shaft were quite smooth. 2. In fitting a key to this crank should it fit hard at the sides, or at the top and botom? *A.* We should make the key to just bear at the top and bottom, and to fit tightly at the sides.

(115) J. C. B., Hamilton, Ontario, writes; We have a compound engine, cylinders 19" and 36', diameter, each 30" stroke. The engine runs at 100 revolutions, and the boiler pressure is 100 pounds; vacuum 24". The diameter of the steam pipe is 7". The cut-off on high pressure cylinder is at 10", and on low pressure cylinder at half-stroke. Will you please tell me the horse power of engine? *A.* This can only be told by applying the indicator, or by measuring the power in some way. It would require a general knowledge of the construction of the engine to estimate the power approximately. On general principles, however, if the engine is well constructed, it will probably develop under the conditions named 300-horse power.

(116) F. J. M., Springfield, Ohio, writes: The stand-pipe of a system of water works is situated on a hill about one-half mile from a certain hydrant. A 24" main leading from the stand pipe passes the hydrant at a distance of about 10 feet, and the hydrant is connected with the main by a 6" pipe. The surface of the water in the stand pipe is 210 feet above the level of the street at the hydrant. How high can a stream of water be thrown through an 1¼" nozzle connected to the hydrant with ten feet of 3" hose? *A.* This will depend on the loss of head from friction between the stand pipe and the nozzle, which as you will readily see may be but little or may be a good deal. This we have no means of knowing. If there was no loss it is probable the jet would reach a height of about 150 feet.

(117) B. W., Boston, Mass., writes: I am an apprentice learning the trade of a machinist. I have worked two years in a rather rough shop, and sometimes I work a month at a time on sheet-iron work, but I have run a lathe and planer probably one-half of the time. What I want to ask is, if it would not be better to leave and go to some other shop and finish my trade? *A.* As we understand it you have agreed to work a certain time to learn a trade, and taking your own statement for it we fail to see that you have serious cause for complaint. One year of the first two in a machine shop, at the lathe and planer, seems to us to be very good indeed. The knowledge you have, or can gain, of sheet-iron work will always be of advantage to you. We advise you to do exactly as you have agreed to do, and the fact that you always do this will be one of the best possible recommendations you could have.

(118) L. H., New York, writes: I am running an engine, 12"x36" at 60 revolutions, and using one 4x16 and one 4½x16 ft. boiler. I also have to supply steam for heating, using about 13,500 feet of 1" pipe. I have to shut the steam off the pipes about one-half the time, being able to keep them open only when the fires are in the best condition. The engine, which is a Corliss, does not cut off at all sometimes, with steam pressure at 65 to 70 pounds. The engine is in good order. Can you tell me of any remedy for the trouble? *A.* It is evident that you have insufficient boiler capacity for the work on the engine and for heating besides. The fact that the engine does not cut off is evidence that it is overloaded. We should suppose a better arrangement than your present one would be to change the pulley on line shaft so as to run the engine, say 80 to 85 revolutions, and then run it with the larger of the two boilers, using the smallest one for heating. We only offer this as a suggestion, since there may be reasons for not doing this with which we are unacquainted.

(119) J. R., Detroit, Mich., writes: A friend of mine claims that in a well 31 feet deep, placing a pump 8 feet nearer the water, that is 8 feet below the surface of the ground, will not improve its action. What I want to ask is: 1. Is this so? *A.* No; 31 feet is too great a distance to lift water with a pump under ordinary circumstances. 2. How far will a pump lift water? A. If every thing is perfeetly tight a pump will lift water from 32 to 33 feet, at the level of the sea. It is never wise, however, to depend on the action of a pump at a greater lift than from 22 to 24 feet. The lift should be even less that this when practicable. 3. When you have 60 pounds of steam on the gauge how do you know it is 60 pounds to the square inch, instead of—for instance—60 pounds to the square foot? *A.* The ordinary steam gauge is graduated to represent pounds pressure per square inch, just as a scale beam is divided to register pounds. It could be just as readily graduated to indicate pounds pressure per square foot, but it is not—for evident reasons—so graduated. 4. How do you set a spring safety valve to blow off at any pressure regardless of the steam gauge. This can be done by multiplying the area of the valve in square inches by the pressure desired, and then by actual experiment, determining what distance the spring will be compressed by such a weight in pounds. For example, you wish the valve to blow off at a boiler pressure of 60 pounds, and the area of the cross section of the valve is 8", multiply 60 by 8 and you have 480 pounds as the pressure the spring must hold. Now if you place the spring on the scales and weight it down with 480 pounds, and measure accurately how much the spring is compressed by the weight, yon will know how much to compress it when over the valve, in order that it shall hold 60 pound pressure per square inch. 5. When setting a valve of a steam engine how do you tell when the crank is on the dead center? *A.* See American Machinist for Nov. 1878. 6. How large should the steam ports in the cylinder of a steam engine be? *A.* It depends on the piston speed. With a properly constructed slide valve the port may be 1-10 the area of the cylinder for a piston speed of from 500 to 600 feet per minute.

(120) J. J. B. H., Indianapolis, Ind., wants to know when the Report of the U. S. Commission to the Paris Exposition of 1878 was completed. He had been informed by the member of Congress from his district that the report was issued a year or more ago, and no more copies are to be had. *A.* You have been correctly informed as to the first copies issued. A small number of copies were printed some months ago, but at a comparatively recent date a large and expensive edition was ordered to be printed and bound. The work comprises five large and elaborate volumes, and although each member of Congress was entitled to receive several copies it was manifestly impossible to supply all who might apply for them. As we stated when noticing the work, we are indebted to the courtesy of Congressman R. P. Flower, of this city, for a copy. He was elected less than five months ago, but had a complete set of the volumes mailed us promptly upon our requesting them. If the member from your district is anxious to have his constituents receive the benefit of free government publications of the most valuable kind, you will probably find the work you seek in the Indianapolis Public Library—if otherwise, look for it in some junk shop.

Business Specials.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing issue.

We receive numerous inquiries relating specially to matters of private interest. While desirous to oblige our friends, we would suggest, that an advertisement of two or three lines under this heading will usually develop the desired information easily and quickly.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

James W. See, Consulting Engineer, Hamilton, O.

Presses and Dies. Ayar Mach. Works, Salem, N. J.

Alfred Wilkinson, Expert Tests of Steam Engines and Boilers, 123 N. 4th St., Phila.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

For circular of Bailey's Portable Hoists, cheapest, best, send to L. Hoffman & Co., 229 River st., Cleveland, Ohio.

Machinists' Bench Tools; largest stock in the United States. Send for Machinist Catalogue, 212 pages. Tallman & McFadden, 607 Market st., Philadelphia.

Can any one give information regarding the Dunbar style of piston packing? Address, Civil Engineer, care American Machinist, 96 Fulton st., N. Y.

Who are the manufacturers of the "Belknap Patent Bolt and Rivet Machine?" Address, Marsh, care American Machinist, 96 Fulton st., N. Y.

Where is the office of the "Multicharge Gun Co.?" Address, W. F. C., care American Machinist, 96 Fulton street, New York.

Who makes, in America, special machinery for manufacturing the small wooden parts of the mechanism of pianos? Address, M. Wilczynski, Hamburg, Germany.

Is there an anti-friction durable metal in use that can be successfully used for small bearings without the use of a lubricating substance? Address, S. P., care American Machinist, 96 Fulton st., N. Y.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John Street, N. Y.

"Slide Valve Gears," by Hugo Bilgram, published by E. Claxton & Co., Phila., describes the easiest method known for correctly proportioning slide valves, link-motions and cut-off gears; price, $1.00.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the American Machinist. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Steel Name Stamps, 15 cts. per letter; Steel Figures, $1 per set. W. G. Sackmann, 59 Vine street, Cleveland, Ohio.

J. E. Kelley, New Haven, Conn., a roofer of long experience, writes to T. New, 32 John street, N. Y.: Your process for manufacturing Prepared Roofing is perfect, giving entire satisfaction.

"Patent Binder" for the American Machinist holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. We can furnish Volume 3 of the American Machinist, containing the full 52 issues of 1880, neatly bound in cloth, ready to ship by express, for four dollars. Unbound, three dollars. American Machinist Publishing Co., 96 Fulton Street, New York.

Ealy's "Blue Book,"—Special classified list of Machinists, Machinery, Railway, Engine and Boiler Makers supplies, etc., with financial standing and paying qualities of all dealers and manufacturers. Much more convenient and reliable than any other work of the kind published. We also furnish full detailed written reports. Price $30 to July 1, 1882. The John W. Ealy Company, 51 Chambers street, New York or 79 Dearborn street, Chicago, Ill.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 Humorous illustrations; 320 pages, 12 mo. Price, $1.50 per copy, by mail, to any address. American Machinist Publishing Co., 96 Fulton St., New York.

Manufactures.

Lewis White will erect a manufactory of improved horse shoe nails, at North Hanson, Mass.

The Reliance Machine Works (E. P. Allis & Co.), Milwaukee, Wis., are being considerably enlarged.

The La Belle Iron & Nail Co., of Wheeling, West Va., will erect a blast furnace at Birmingham, Ala.

D. F. Coughlan, Holyoke, Mass., will enlarge his boiler shop.

The Gray Iron Co., of Chicago, have added a brass and bronze foundry to their works.

Cofrode & Saylor, bridge builders, of Philadelphia, Pa., have purchased a five-acre tract at Pottstown, Pa., upon which they will erect iron mills.

The J. R. Torrey Razor Co., Worcester, Mass., will erect a shop 126x42 feet, to be occupied in June.

The Inman Company has decided to build its $1,500,000 cotton factory at Athens, Ga. They will have an abundant water power.

The Moline (Ills.) Plow Co., has donated $1,240 worth of agricultural implements to the sufferers by the Michigan fires.

Thomas Douglass, of Youngstown, O., is making arrangements to build a machine shop in Warren.—*Industrial World.*

Ellis & Lessig, Pottstown, Pa., will erect a 60x100 foot iron foundry in connection with their machine shop.

James Moore, Philadelphia, has cast a roll 48" diameter, and weighing 74,000 pounds, for a blooming train in the Bethlehem Iron Works. It is probably the largest ever cast in the United States.

The Niles Tool works of Hamilton, Ohio, have just opened an Eastern branch warehouse at 22 So. 6th Street, Philadelphia. E. V. Douglas will be in charge.

A company is being organized in Cleveland for the manufacture of machinery for the transmission of power, under the patents of Mr. John Walker. Mr. Joseph B. Perkins is one of the stockholders.—*Trade Review.*

The Monsanto Steam Generator Co., 95 Liberty street, New York, are building several of their new water tube boilers on order. Tests will soon be made of this generator. The contracts are being filled by Kelly & Ludwig, Philadelphia and New York.

The Holyoke, Mass., Water Power Co., has put in two steam engines at its Cabot street Mill, of 150-horse power each, from the works of the Hartford Engineering Company. They will be used to run the mill when the water wheel is out of order, or when the water is out of the canal.

G. M. Marshall & Son, Kilbourn City, Wisconsin, have issued an illustrated catalogue of their Jonval Turbine Water Wheel, which, in addition to its usefulness to those wishing to purchase water wheels, contains quite a number of useful tables and rules for millwrights and mechanics generally. This firm manufacture a large line of machinery in addition to water wheels.

The stove foundry building of the Phillips & Buttorff Manufacturing Co., at Nashville, Tenn., is of immense proportions. The works are enclosed in a four-acre lot and have a floor space for manufacturing purposes of 24,000 square feet. The store and warehouse space is 54,000 square feet. The company has eighty-six men in its employ at the present time, and will have about 200 when in full blast.—*Journal of Commerce and Manufacturers Record.*

We learn from the Moline *Review-Dispatch* that a new wagon manufactory is to be started in Rock Island. A company is to be organized with a capital of $150,000 as a basis of operations. The leading parties in the new enterprise are Frank Ill, Weyerhauser & Denkman, W. E. Brooks, George Wagrer, I. Huber, C. Spiedel, F. Ludolph and David Don. The site chosen for the new shops is between the two cities, Moline and Rock Island, but just over the line in the latter city, where shipping facilities are first class and there is plenty of room for the works to expand, and for homes for employes Over $100,000 of the stock is already subscribed, and the balance will soon be made up.

The Chicago Car Wheel Works of J. H. Bass recently cast for the Union Iron and Steel Co., the foundations for a steam hammer weighing thirty tons. It took exactly seven minutes for the molten stream to run from a large tank into the mould, which had been prepared with especial care to receive it. This is said to be the largest casting ever made by any one firm in any city west of Pittsburg.—*Railway Review.*

Manning, Maxwell & Moore, 111 Liberty Street, New York, write us:

We are engaged now in collecting matter for a fine Illustrated Catalogue of Railway and Machinists Tools and Supplies, and intend to make it one of the most complete and interesting works of the kind ever published. It is our intention to have it contain cuts and lists of all well known tools and appliances for boilers, engines, etc., and we shall incorporate many articles that we never expect to sell, but it will afford our customers a reference book that will be complete. Any of your readers who desire their goods to be illustrated in our book will please send us duplicates of price lists and when ready we will call on them for electrotypes.

In our issue of March 25, 1882, we undertook to notice a change of title in the business of Frank H. Pond, 707 & 709 Market Street, St. Louis, Mo., but, as it now seems, got things somewhat mixed. We should have said, that Mr. Pond will continue to act as the western representative of the Steam Pump business of Henry R. Worthington, New York, doing this business under Mr. Worthinton's name, as formerly. Mr. Pond's *other* business will hereafter be transacted under the name and style of the *Pond Engineering Co.*, at the same place, without change of management. The object of making this change in title is to prevent confusion.

At the works of the Pittsburgh Steel Casting Co., on the 2d inst, a piece of work was performed which will attract no slight degree of attention among iron and steel workers. It was the making of the largest Bessemer steel casting ever made in this country. The casting was a cog-wheel, to form part of a blooming mill for their own works, and will weigh, when turned and finished, over 16,000 pounds. The same works have heretofore made crucible steel castings of three or four tons weight, but nothing at all approaching this in size has been cast of either grade of steel.—*Industrial World.*

The new works of the Northwestern Horse Nail Company are to be located at Brighton, Ills., and it is expected that the establishment will be in running order by July 1. The buildings are to be of brick, will cover about 75,000 square feet of ground, and are to be situated so as to form a hollow square. The two large buildings will be 80x350 feet, the buildings connected thereto will be 80x86 feet, leaving a yard 160x186 feet, and side railroad tracks, will be so arranged that the iron for the mill will be received at one corner of the square and the nails delivered at the other. A 75-horse power engine, and a battery of five boilers of 100 horse power each, including 80 to 100 forging machines and 50 to 60 finishing machines will be added. Two hundred and fifty men will be given employment, and the capacity of the works will be from 2,000 to 2,500 tons of manufactured nails per annum.—*Commercial Bulletin.*

Since moving into the new factory the Crosby Steam Gauge and Valve Company, 97 Oliver Street, Boston, Mass., have been extremely busy. The factory is well stocked with new and the latest improved brass finishing lathes and special machinery for manufacturing their specialties. Standard gauges and dies are used in connection with a most admirable system of a duplication of parts. They have just made a new test gauge which for accuracy and excellence of workmanship, in our judgment, has never been excelled. The bearings are all of nickel as hard as can be worked, and when placed in an exactly vertical position the pointer remains at zero, but the least movement in either direction will cause a deflection of the pointer. Other tests to which it was subjected proved conclusively that there was practically no lost motion in the bearings and connections. This gauge is graduated advancing by single pounds to 240 pounds. The inner circle is marked to show the height of a column of water, to give the different pressures, while the outer circle shows the temperature of steam at the different pressures upon the dial.

Smith, Vaile & Co., Dayton, O., have materially enlarged their steam pump works and are running over-time to fill orders. They have made many improvements in their patterns during the last year. One especially is their new improved removable water cylinder. In the present arrangement the water box of 7-inch stroke will admit a removable cylinder of from 3" to 5½" bore; 10" stroke will admit of from 4" to 7½" diameter cylinder; 14" and 18" stroke will admit from 6½" to 9½" or 8" to 12" bore cylinder; larger sizes in same proportion. The benefits of this removable cylinder are particularly applicable for railway water service, as the railway company can select the steam cylinder and stroke for the average duty of their water stations, and by varying the size of the removable water cylinder can have all their pumps interchangable in every part, still doing their heavy or light duty of any station on the line. As, for example, for stations of light duty use larger removable cylinder and for heavy duty use smaller. Another benefit of this removable water cylinder is that in case it should need reboring it can be removed and another inserted without changing any connections or stopping the pump to exceed one hour, and the cylinder can be rebored at their leisure ready for any other pump which may need it.—*The Railway Review.*

Machinists' and Engineers' Supplies.

New York, March 23, 1882.

Some of the dealers report business as good at present as atany time during the past year, while others begin to think business is dull, but on the average we believe there is no reason to complain. The manufacturers are yet behind their orders but are catching up.

Hill, Clarke & Co., 36 and 38 Oliver Street, Boston. Mass., have just issued a new illustrated catalogue of 152 pages, containing indexed descriptions of leading modern improved iron working machine tools, with detached parts and separate appliances, also, steam hammers and wood working machines.

Heald & Morris, manufacturers of the Heald & Sisco centrifugal pumps and horizontal engines, Baldwinsville, N.Y., have just issued the eighteenth and revised edition of their illustrated catalogue. This edition of 102 pages, contains indexed descriptions with illustrations of their specialties together with a list of testimonials.

Iron and Metal Review.

There is still an uncertainty prevailing in reference to future developments in the Pig Iron market, therefore the transactions continue to be of a hand to mouth character, and the dealers begin to complain of general dullness. We quote:

Foundry No. 1 at $26 to $26.50; Foundry No. 2, X, $24.50 to $25; Grey Forge, $22.50 to $23. Merchants bar, active with no change in prices.

The market for Foreign Iron remains dull with small sales. We quote Gartsherrie at $25.50 to $26; Coltness, $26 to $26.50; Glengarnock, $24.50 to $25; Carnbroe, $24.50; Eglinton, $23.50; Summerlee, $25.50. Prime Wrought Iron Scrap is dull at $33, prime selected from yard. Market for Copper nominal. We quote Lake Superior at 19c. Banca Tin, 29c. Straits and Malacca, 25c. Australian and Billiton, 25¼c. to 25¼c. Spelter, Western, 5¾c. to 5¾c. Refined, 8c. to 8¾c. Silesian, 5¾c. Lead, 4 9-10c. Antimony, 13c. to 14¾c. for Foreign, and 13¼c. for Nevada.

WANTED

"Situation and Help" Advertisements, 30 cents a line, each insertion. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing issue.

Wanted—A good Machine Blacksmith, and 3 or 4 good Machinists. Address, Eagle Iron Works, Des Moines, Iowa.

Wanted—A foreman to take charge of 50 to 100 men in a machine shop on special work. Address, "H.," box 11, office American Machinist.

Wanted—Two or three good lathe and planer hands; none other need apply. Torrington Manufacturing Co., Torrington, Conn.

An Analytical and Technical Chemist of experience desires an engagement. Good reference. Address, "Chemist," care of American Machinist.

Wanted—By a general machinist, a position where integrity and strict attention to business will meet with an equivalent. City or country. "D. S.," Box 8, American Machinist.

Wanted—Situation as foreman or as tool maker by machinist of 20 years experience. East & West references, etc. Address until April 6, "J. H.," Box 2, care American Machinist office.

Wanted—Three good tool makers who can make tools for brass and iron fittings. Good wages and permanent employment given. Apply in person or by mail to "The Joel Hayden Brass Co.," Lorain, Ohio.

Foreman Wanted—By a firm engaged in the manufacture of Steam Engines, Rolling Mill and Mining Machinery, must be steady, industrious and systematic. State age, experience and salary. Address, A. J. Nutting & Co., Chicago, Ills.

Wanted—A man thoroughly experienced in Portable and Traction Farm Engine building, to design and superintend building them. Address, stating experience and references, John S. Davis' Sons, Davenport, Iowa.

Agents wanted, familiar with machinery and engines, to solicit consuming trade in the New England States, New York and New Jersey, for Cylinder Lubricating and Engine Oils. Address with references, "Oils," 120 Maiden Lane, New York.

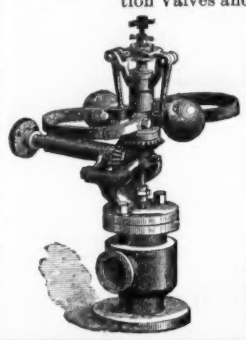
Horizontal Engine, Plain Slide Valve, 20 by 48 for sale. Atlantic Steam Engine Works, Brooklyn, N. Y.

FOR SALE.

Wheel Quartering Machine, made by Wm. Sellers & Co. Address,

BALDWIN LOCOMOTIVE WORKS,
PHILADELPHIA.

COOKE & CO., Formerly Cooke & Beggs,
Dealers in MACHINERY AND SUPPLIES.
6 Cortlandt Street, New York.
AGENTS FOR
The Waters Perfect Governor,
Having Adjustable Speed, Automatic Safety Stop, Sawyer's Lever, and Solid Composition Valves and Seats.



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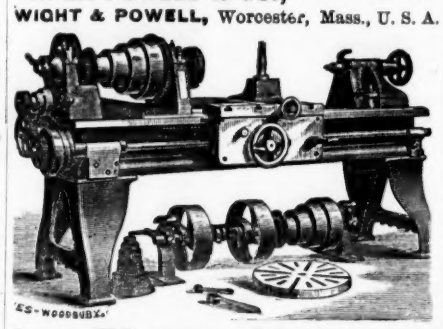
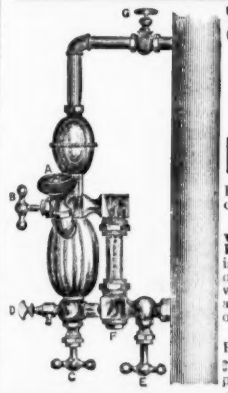
SUPPLIES
For Machinists, Railways, Mills, Mines, &c.

Please send for circular and state that you saw the advertisement in this paper.

A. M. POWELL & CO., Successors to
WIGHT & POWELL, Worcester, Mass., U. S. A.



Iron Working Machinery.



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Manufacturers of the
HOLLAND
LUBRICATOR
For lubricating the valves & cylinders of steam engines
Operating with **downward visible drop.** The Principle of this Lubricator is entirely new; being the only one manufactured operating with a downward visible drop, and does not conflict with any other Patented Lubricator.
Protected with Letters Patent, granted July 5, 1881
☞ A saving of from 50 to 90 per cent. in cost of oils.

PORTABLE and STATIONARY ENGINES
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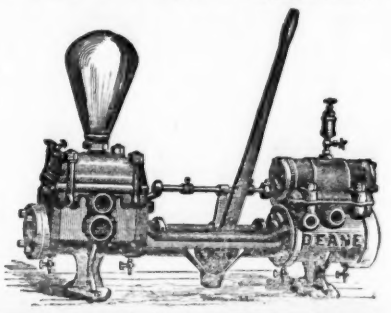

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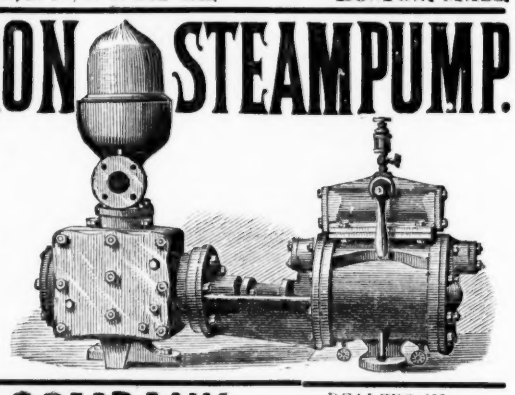

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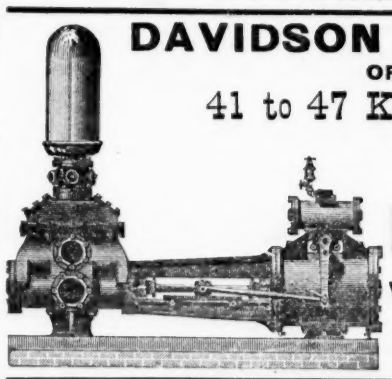

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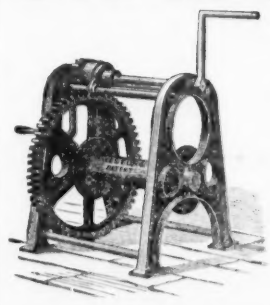

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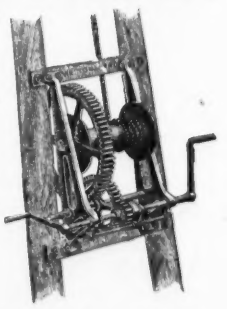

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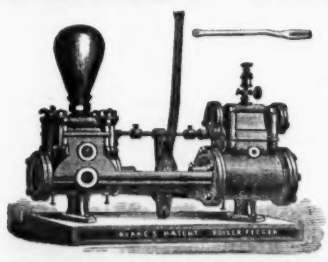

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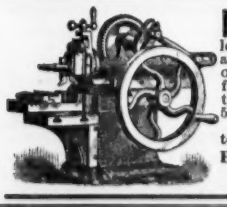

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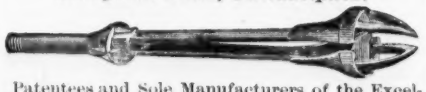

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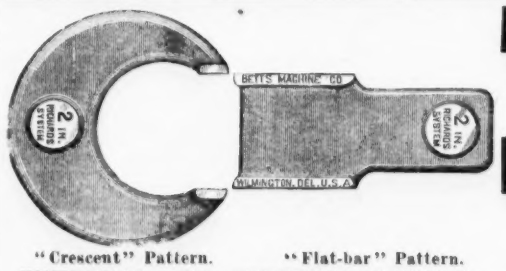

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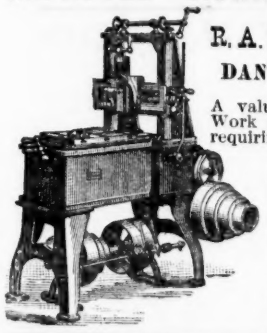

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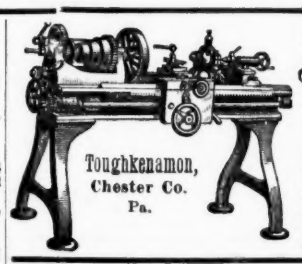

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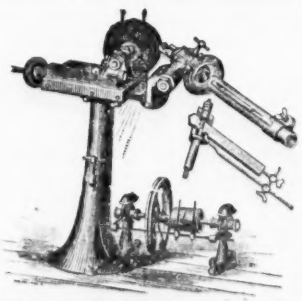

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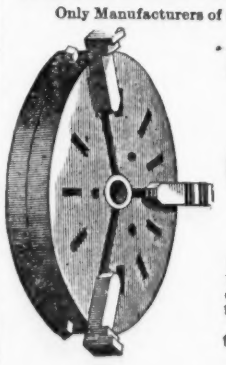

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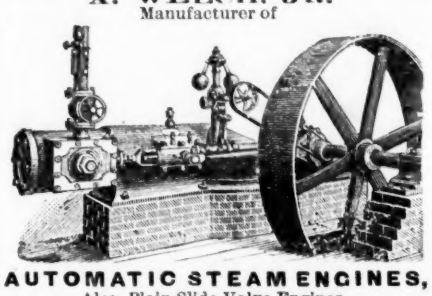

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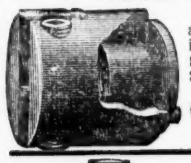

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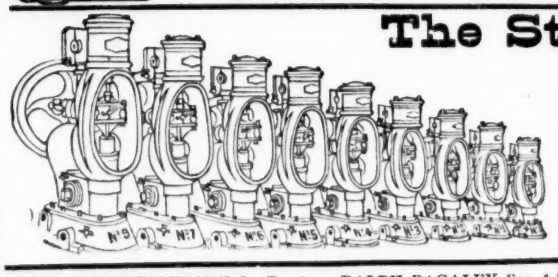

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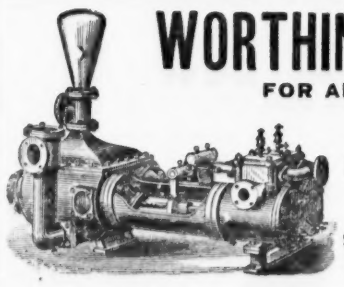

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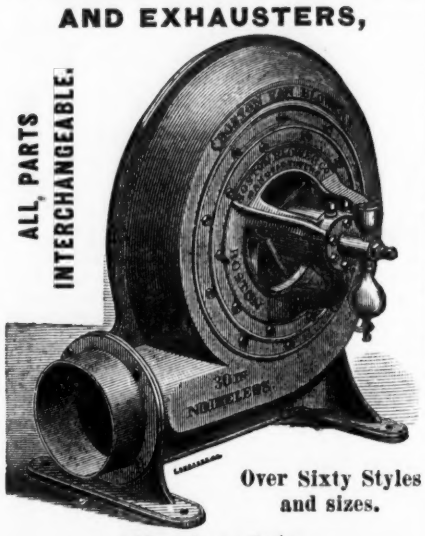

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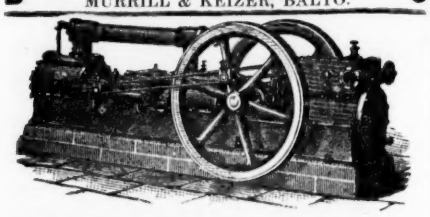

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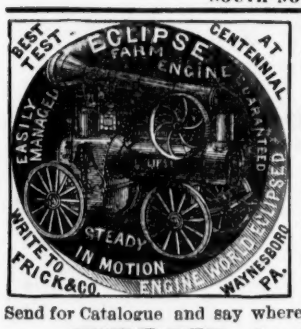

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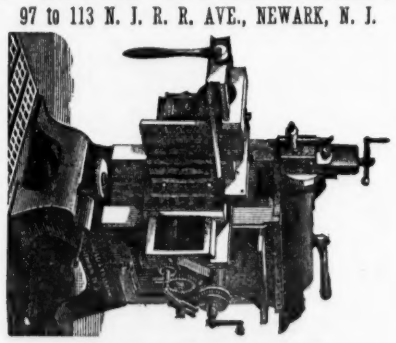

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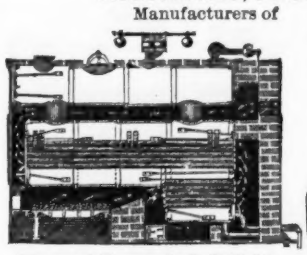

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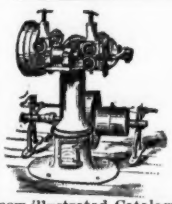

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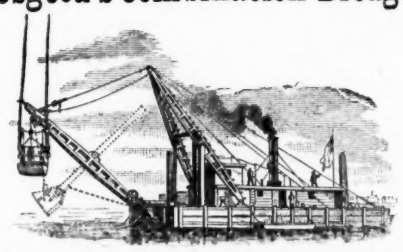

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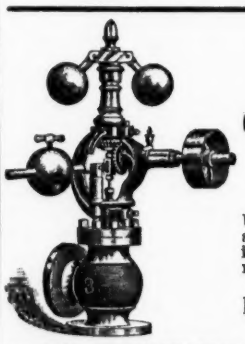

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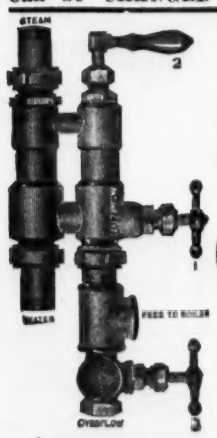

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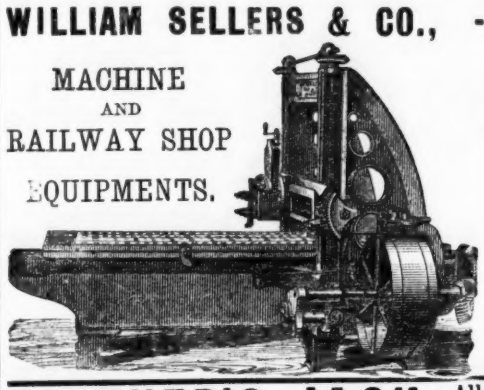

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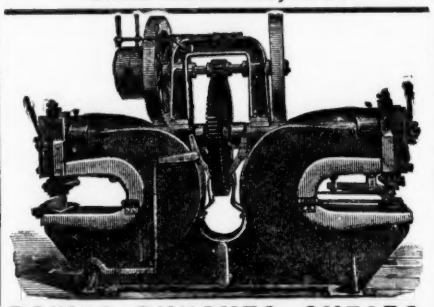

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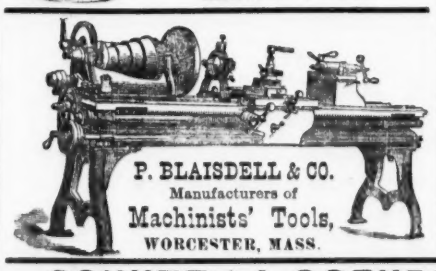

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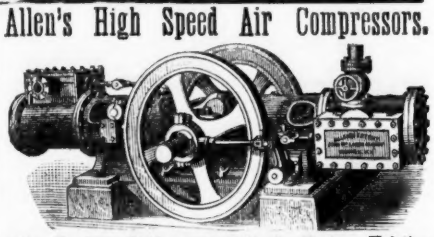

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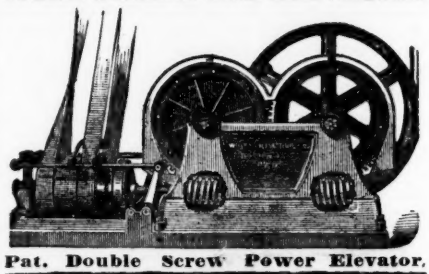

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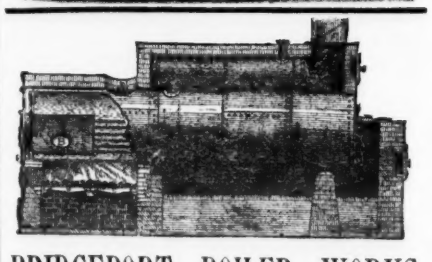

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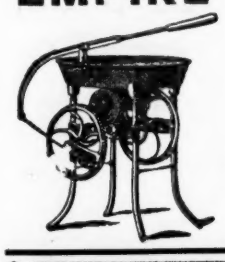

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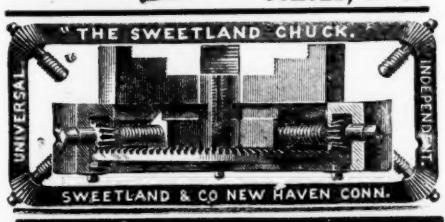

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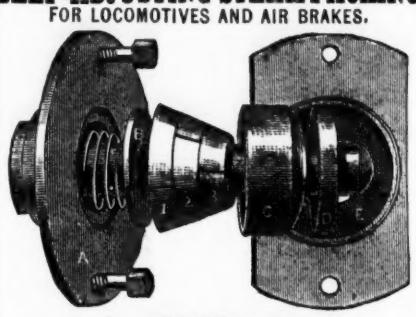

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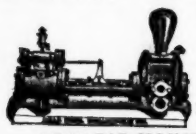

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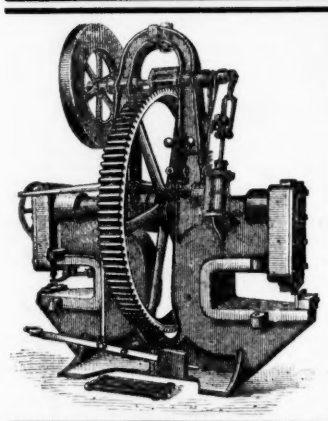

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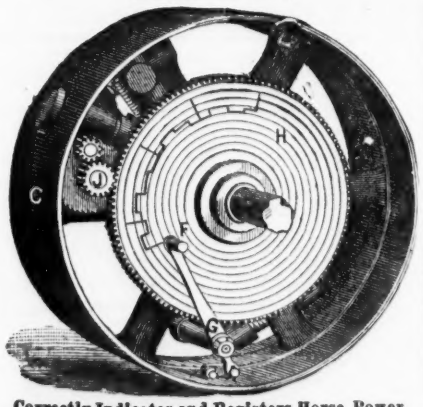

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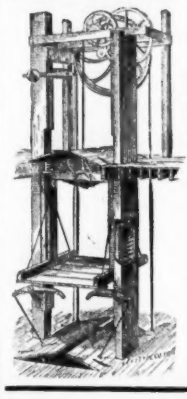

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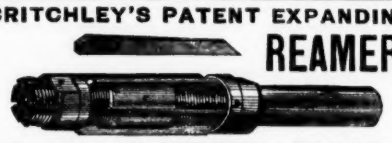

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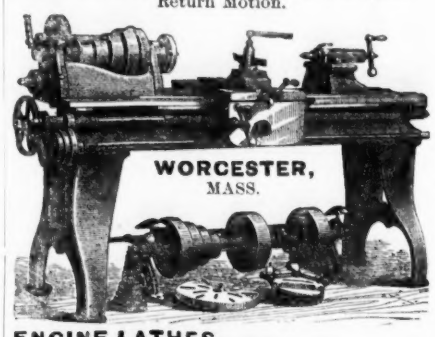

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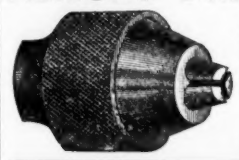

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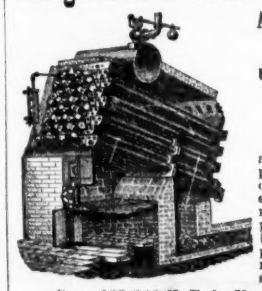

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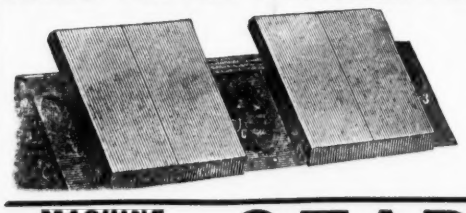

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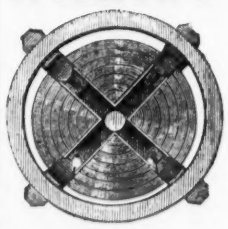

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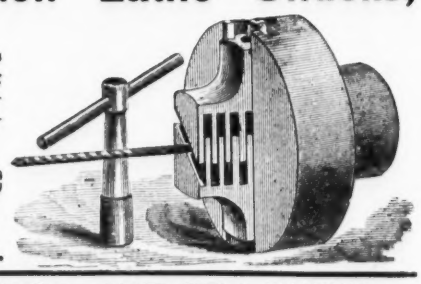

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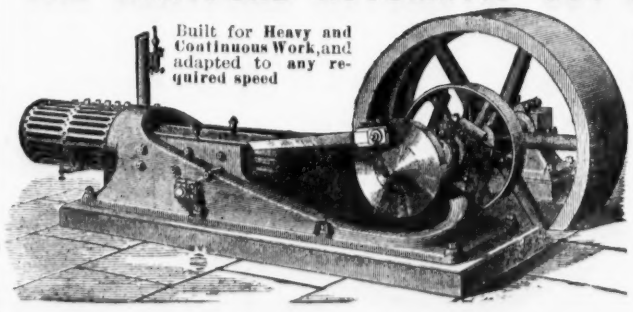

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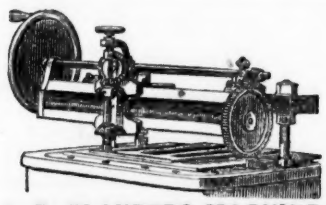

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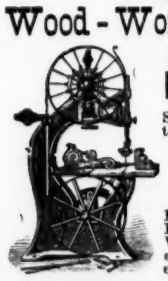

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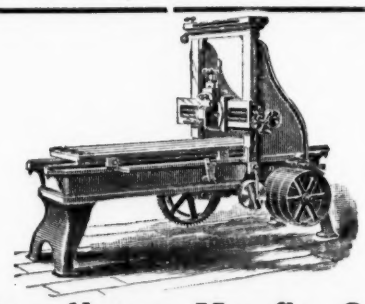

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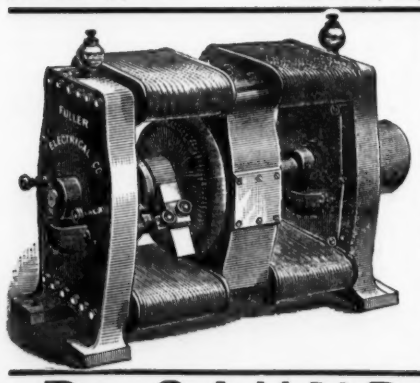

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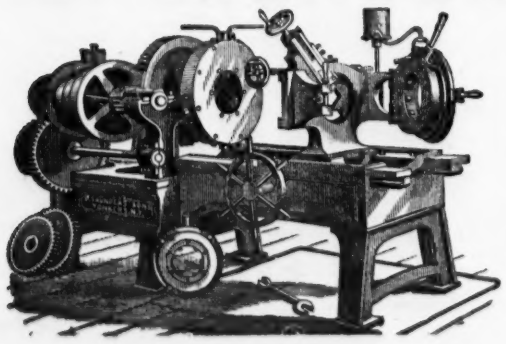

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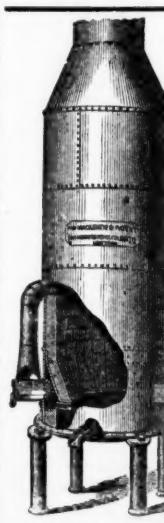

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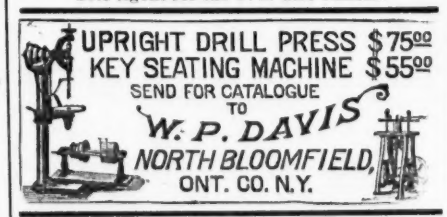

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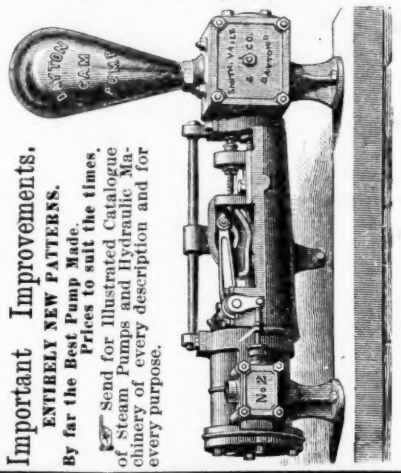

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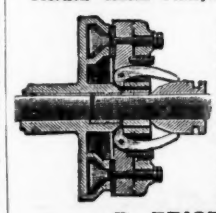

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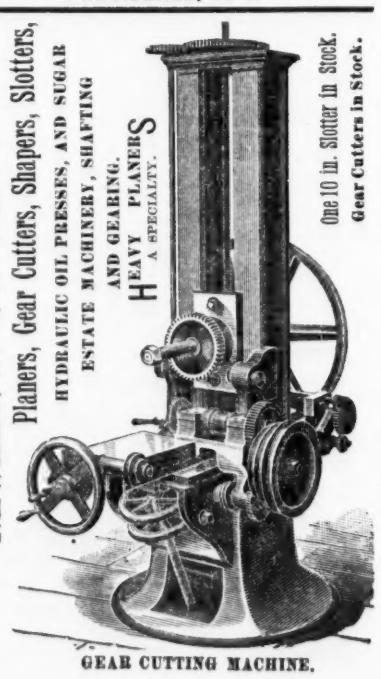

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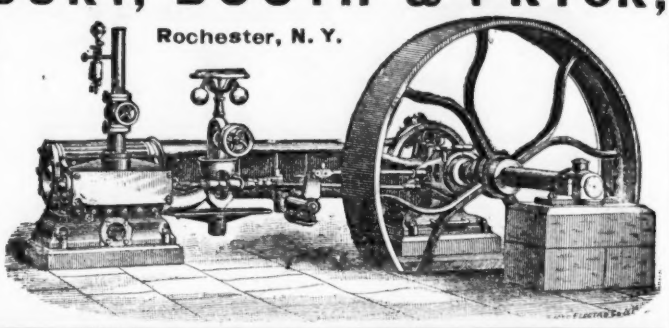

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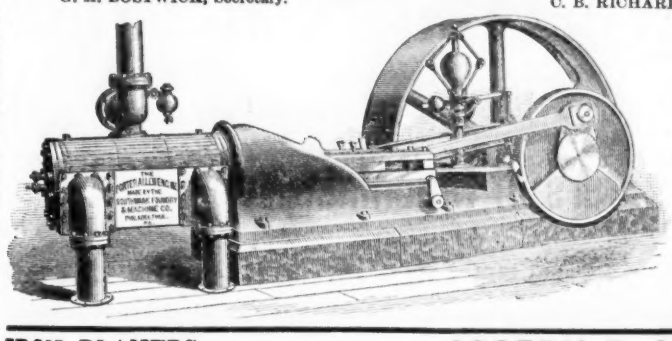

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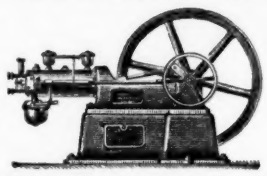

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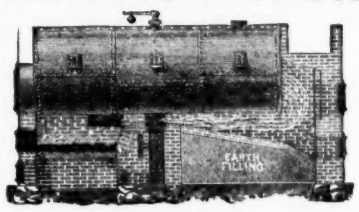

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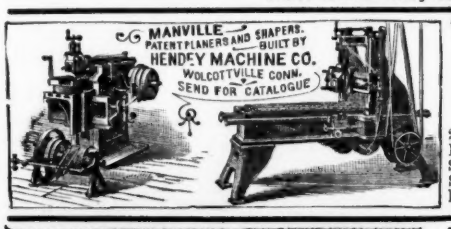

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One	8 ft. x 26 in. x 26 in.	Pond.

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One	4 ft. x 24 in. x 20 in.	New Haven Mfg. Co.
One	7 ft. x 24 in. x 24 in.	Cone Machine Co.
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One	6 ft. x 26 in. x 26 in.	Aldrich.
One	14 ft. x 72 in. x 48 in.	Schenectady.
One	3 ft. x 17 in. x 12 in.	Lathe & Morse.

New Engine Lathes.

One	18 ft. x 48 in.	Fifield.
One	18 ft. x 36 in.	"
One	16 ft. x 72 in.	"
One	12 ft. x 24 in.	"
One	16 ft. x 26 in.	Perkins.
One	20 ft. x 36 in.	Fifield.
One	8 ft. x 20 in.	Perkins.
One	16 ft. x 26 in.	Niles Tool Works.
One	6 ft. x 16 in.	Perkins.
One	8 ft. x 17 in.	"

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One	18 ft. x 32 in.	"
One	11 ft. x 28 in.	Ames Mfg. Co.
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2	26 in. x 26 in. x 6 ft. "	"
2	30 in. swing, 15 ft. bed. Engine Lathes.	"
1	22 in. swing, 13½ ft. Bed Engine Lathes.	"
5	22 in. x 12 ft. Engine Lathes.	April.
3	19 in. swing, 10 ft. Bed Engine Lathes.	March.
4	11 in. " 5 ft. "	April.
2	30 in. " Upright Back Geared Drills.	"
2	9 in. Shapers. New.	March.

The following on hand:

2	19 in. swing, 10 ft. Bed Engine Lathe.	New.
2	19 in. " 8 ft. " "	"
4	18 in. " 8 ft. " "	"
1	15 in. " 5 ft. " "	"
1	17 in. " 6 ft. " "	2d-hand.
1	17 in " 7½ ft. " "	"
1	15 in. " 15 ft. " "	"
1	14 in. " 6 ft. " "	New.
1	12 in. " 4 ft. " "	2d-hand.
1	12 in. " 4 ft. " "	New.
1	15 in. " 9 ft. Hand Lathe.	New.
1	12 in. " 6 ft. Bed Hand Lathe.	New.
1	10 in. " 4½ ft. " "	"
1	Boring Lathe, 16 ft. bed. 48 in. swing.	
1	Round Arbor Fox Lathe. Fine order.	
1	21 in x 4 ft. Iron Planer. Whitcomb.	
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2	38 in. Swing Upright Drills. B. G. & S. F.	New.
1	24 in. Swing Upright Drill. Ames.	New. B.G.&S.F
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1	21 in. Upright Drill.	Nearly New.
1	18 in. Bench Drill.	
2	Wall Drills, heavy.	Second-hand. 60 and 72 in
1	6 in. Shaper. New.	Hand or Power.
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1	Pond's Double Milling Machine.	2d-hand.
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5	4½ in Hyde's Patent Centering Machines.	New.
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4	Double Acting Presses, No. 3,	nearly new.
4	Single-Acting Presses, for power,	"
100	Foot Presses,	nearly new.
1	Medium Power Punching Press.	Second hand.
2	Small " " Presses.	"
1	Foot Punch, with bench.	New.
1	Lot Pistol Machinery.	Second-hand.
1	Grind Stone and Frame.	
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1	Crane.	Second-hand. 20 ft. jib. 6 Tons.
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One	Engine Lathe, 36 in. x 15½ ft.		A1 order.
One	" " 28 in. x 16 ft.	Fifield.	New.
One	" " 28 in. x 12 ft.	"	"
One	" " 24 in. x 12 ft.	"	"
One	" " 24 in. x 10 ft.	"	"
One	" " 24 in. x 10 ft.	New Haven.	
One	" " 20 in. x 12 ft.	Ames.	New.
One	" " 20 in. x 8 ft.	"	New.
One	" " 18 in. x 10 ft.	Jones & Lamson.	New.

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One	" " 13 in. x 6 ft.	Ames.	New.
One	" " 13 ft. x 5 ft.	"	"
One	Hand Lathe. 14 in. x 5 ft.	Hendey.	New.
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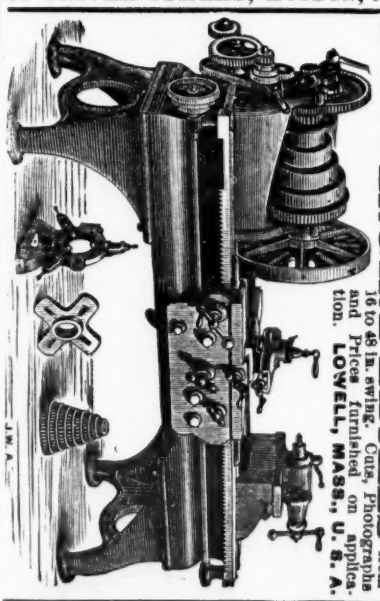

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16	in. swing,	6	ft. bed.	Ames.
16	" "	6	" "	Nutted. Barnes.
17	" "	6	" "	Wright. (on hand)
19	" "	8	" "	Gray.
20	" "	10	" "	Fifield.
20	" "	12	" "	"
21	" "	10	" "	Blaisdell.
24	" "	12	" "	"
26	" "	12	" "	Lathe & Morse.
26	" "	26	" "	Powell.
36	" "	16	" "	Fitchburg.

PLANERS.

16 in. x 16 in. x 3½ ft.	Parker.
20 in. x 20 in. x 5 ft.	Hendey.
22 in. x 22 in. x 4 ft.	Pease.
22 in. x 20 in. x 4 ft.	Pond.
24 in. x 24 in. x 6 ft.	Ames.
24 in. x 24 in. x 6 ft.	Hendey.
26 in. x 26 in. x 6 ft.	Gleason
30 in. x 30 in. x 10 ft.	Fitchburg.
32 in. x 32 in. x 10 ft.	Gleason.

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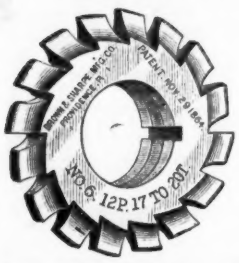

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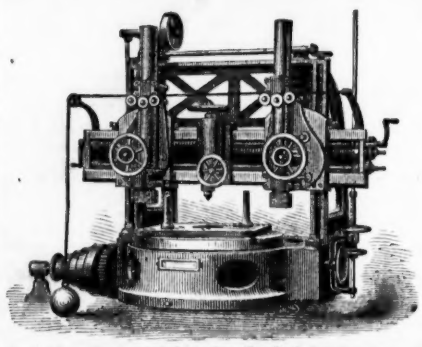

5, 6, 7, 8, 10, 12, 14 and 16 Feet Swing.

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Salem, Col. Co., Ohio, Nov. 27, 1880.
We have just finished another pulley, 12'x27" face, weight 8860 lbs. Yesterday morning at 9 o'clock the rough casting lay on the floor by the mill and we commenced putting on the machine; got a cut started at 10.45 a.m.; finished the rim complete by 9.30 p.m., and got started on facing and boring the hub by 10 p. m.; started again at 7 a.m. this morning, and the pulley off at 11 a.m., 17 hours work all told, including handling on and off The casting was not a very true one and we chose to take three cuts over the face. Hub was 18" deep, with straight core, bored to gauge and chamber on the machine. Hub faced on one side. If you hear of better time let us know—only 10¾ hours on the rim of pulley. Truly yours,

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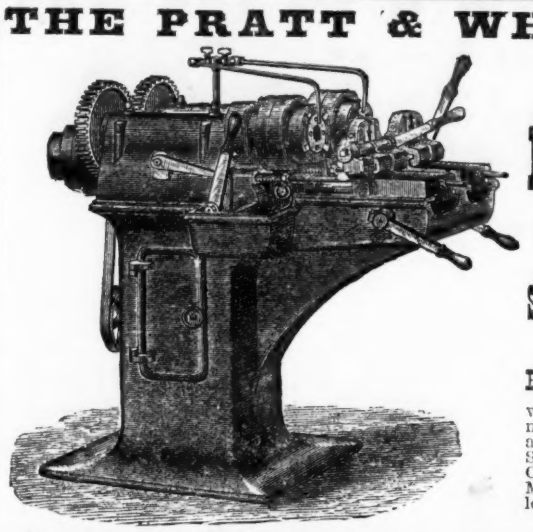

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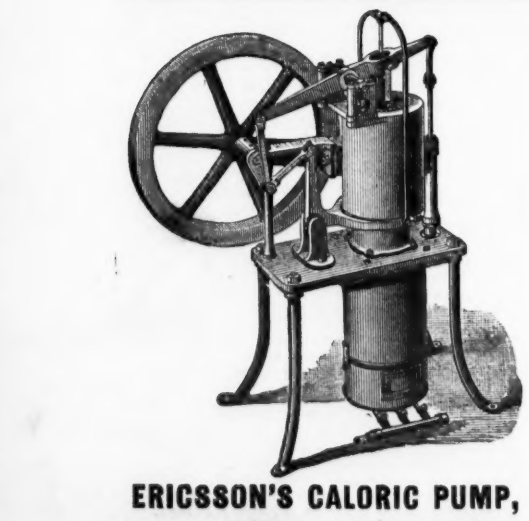

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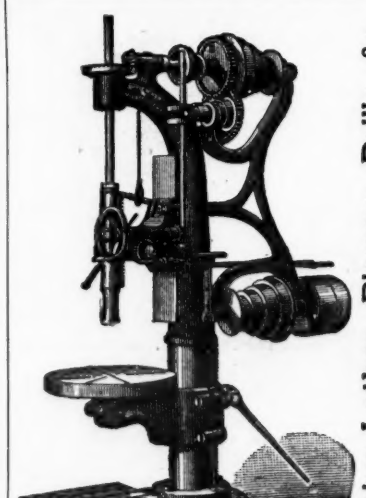

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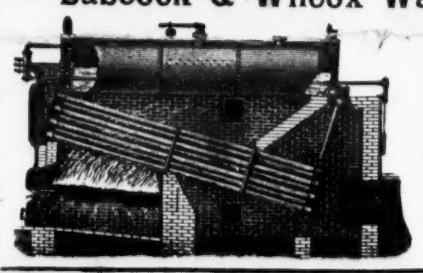

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